POPULAR WIRELESS, December 3rd, 1927. REGISTERED AT THE G.P.O. AS A NEWSPAPER

A NEW CONSTANT-REACTION CIRCUIT (See Page 691.)

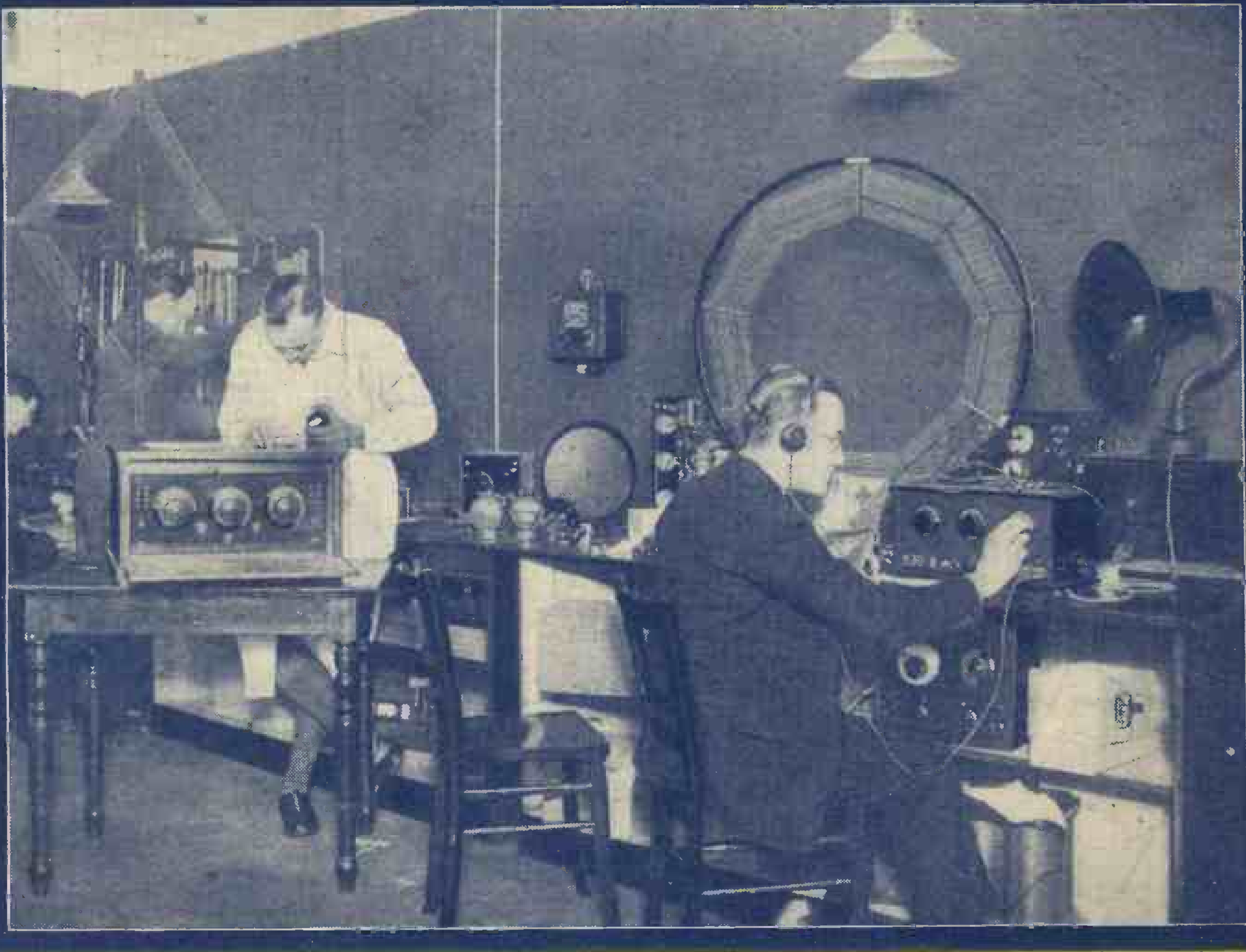
Popular Wireless

Every Thursday
PRICE
3d.

No. 287. Vol. XII.

INCORPORATING "WIRELESS"

December 3rd, 1927.



Special Features In This Issue

Measuring Your Eliminator Voltage. H.T. Economy
"Why I Don't Broadcast!" By Chaliapine
THE "PROGRESSIVE" TWO
The R.S.G.B. and "Q.S.T."
Are Reflex Circuits Fundamentally Unsound?

An interesting sidelight on radio conditions in Germany is afforded by our cover photograph. Here is shown the wireless set testing laboratory installed in the offices of one of Berlin's weekly journals.

An outstanding success

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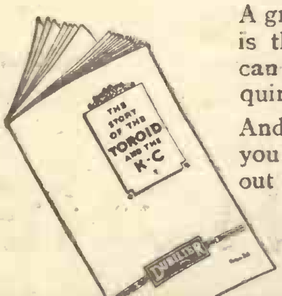
A great advantage of this coupling unit is that Dumetohms of various values can be inserted to suit your own requirements.

And the greatest advantage of all is that you can get this Dubilier R.C. Unit, without doubt the finest obtainable, for 7/-.


THE STORY OF THE TOROID AND THE R.C
DUBILIER

There is a wealth of information in the booklet shown here. In addition there are full instructions on how to make up five different valve circuits each possessing unique advantages. Don't be without your copy. Your dealer will hand you one, or if he is out of stock, we shall be pleased to send you one, post free 3d.

DUBILIER

DUBILIER DICTA

No. 3.

★

Several people have written to ask us whether the Dumetohm will lose its resistance "if the air is allowed to get in." The answer is, of course, that the air was never taken out. The Dumetohm does not depend upon atmospheric pressure, negative or otherwise, for its efficient working, nor are climatic changes likely to affect it.

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Incidentally, since Messrs. A. C. Cossor included it in the specification of their most successful set "The Melody Maker," the popularity of the Dumetohm has gone up still further, and, if final proof of this popularity be required, it is surely to be found in the sincerest form of all flatteries which have lately been lavished on this wonderful little resistance.

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Whilst on the subject of Resistances, have you a selection of Dubilier Filament Resistors by you? If you do any experimental work you will find them invaluable. They only cost 1/- each and they clip neatly into the Dumetohm Holder, which also costs 1/-.

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One of these Dumetohm Holders connected into each filament lead of that new set you are building, will enable you to make comparative tests between the results given by valves of different filament voltage without changing your L.T. Battery.

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Perhaps you are using four 6-volt valves and want to put in a 2-volt H.F. valve to compare it with the one in use. In that case you clip in a Resistor of the value necessary to bring down the current from your 6-volt accumulator to the normal filament consumption of your 2-volt valve.

★

It is easy to calculate the Resistor to use, but for convenience we reproduce two charts on p. 16 of our Catalogue which give the information in a handy form. Remember to choose a Resistor which will pass a current that the filament can handle in safety.

Advt. of The Dubilier Condenser Co. (1925) Ltd., Ducon Works, North Acton, London, W.3.

TC80

FREE
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including blue print and full details will be supplied for any one of these receivers. Booklets, including blue print of the other five receivers, 6d. each.

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K.1. 3-valve receiver employing the famous K.L.1. valves.

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D.P.1. 3-valve receiver—simple to construct.

D.P.2. Similar to D.P.1, but gives greater range and selectivity by means of a neutralised H.F. stage.

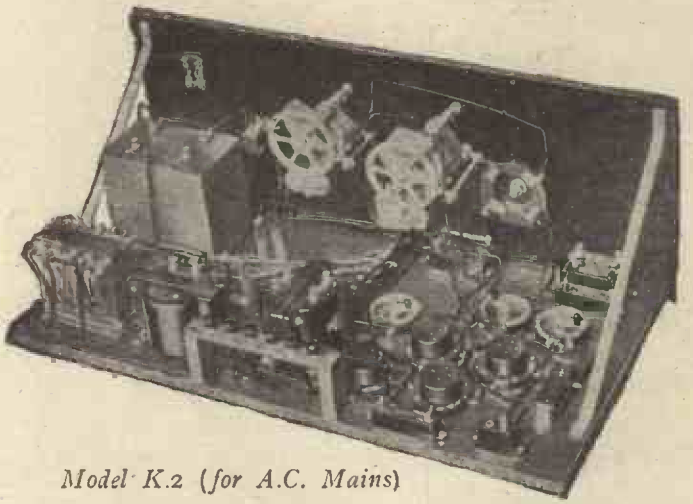
If you want distance

there are two special circuits incorporating the Marconi S625 Shielded Valve.

T.1. 4-valve receiver, including 1 H.F. stage, with S625 valve.

T.2. 5-valve. Two H.F. stages, with S625 valves. Stations hundreds of miles away can be tuned in with complete stability.

For convenience and economy build this battery-less receiver



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BUILD for yourself a receiver that needs no batteries—no accumulators; that costs next to nothing to run; that will *always* spring to life at the turn of a switch. Build now from the *free* Marconiphone circuits. Full constructional details and full-size wiring plan are provided. You cannot go wrong.

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Please send me FREE constructional booklet, including blue-print for circuit……………………

I am also enclosing……………………for the following booklets……………………

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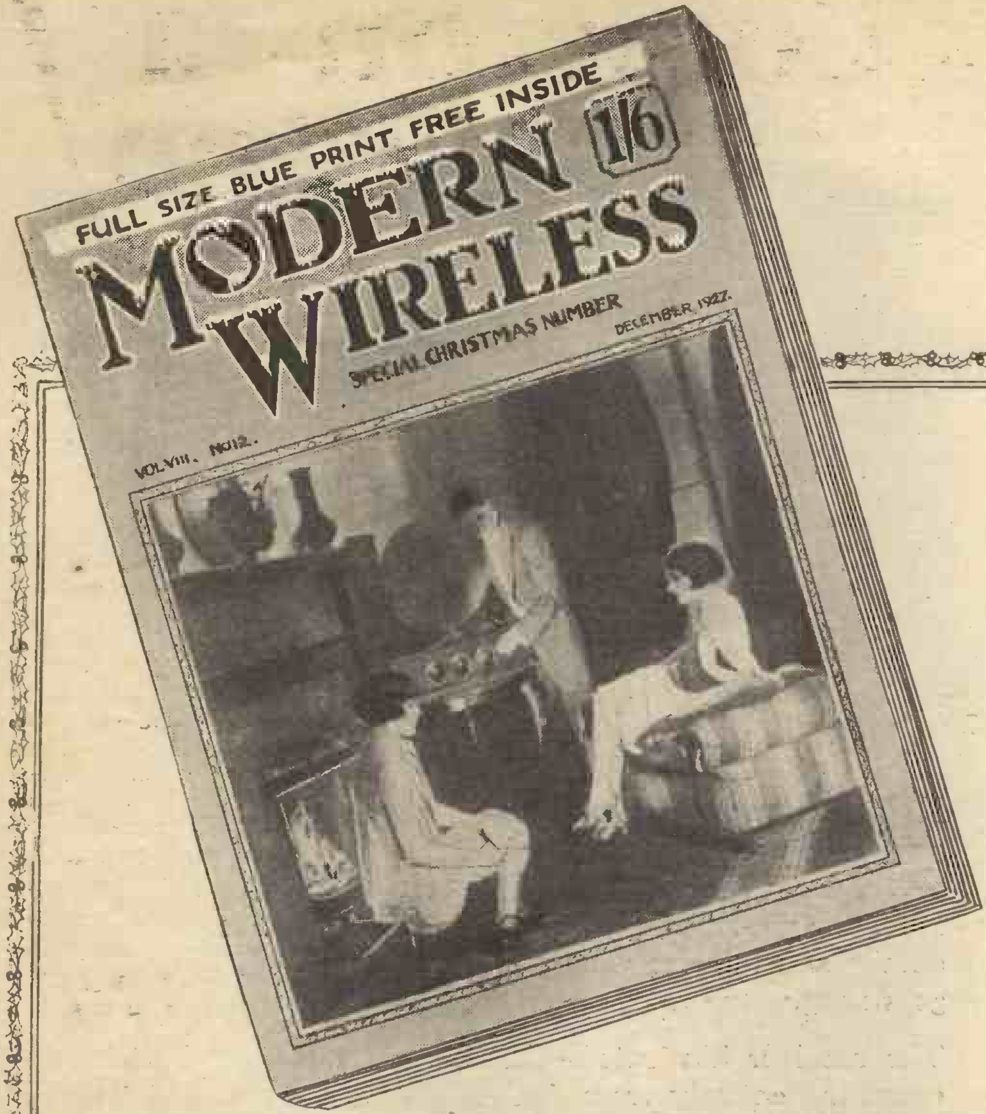
ADDRESS…………………… *COUNTY*……………………

P.W.



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"Come on--a Charleston"!

"Isn't it clear? Wonderful, eh? Made it myself. Marvellous! Come on—shake a leg there!"

"Mind the valves, John!"

"*That's* all right: You can't bust *Ediswan* Valves!"

* * *

Have you made the New R.C. Threesome—the new model brings in many additional stations with all the quality of the original receiver. Two hours work. 50/- for parts. Only 5 simple connections. Anyone can make it. But you *must* use Ediswan valves to get out of the set all it is planned to do.

EDISWAN VALVES
Clearest
Strongest
Last the Longest
A type for every purpose

EDISWAN

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Please send, post free, presentation copies of the New R.C. Threesome Instruction Book and Blue Print.

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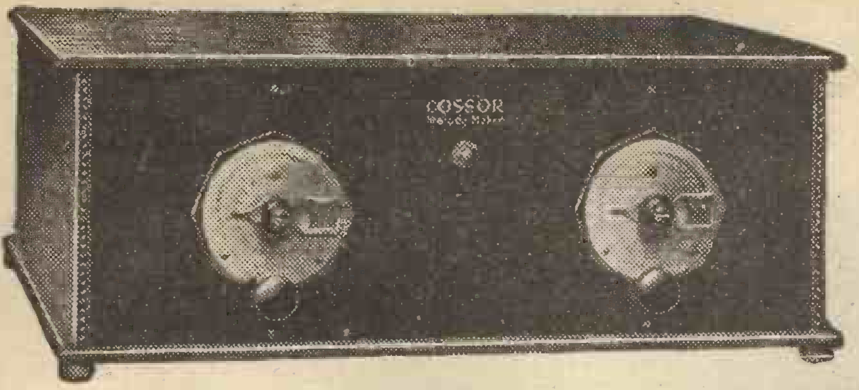
V.71



THE "Melody Maker" OWES ITS SENSATIONAL SUCCESS TO ITS Cossor VALVES

NOT since Broadcasting began has there been such an astounding success as the wonderful Cossor "Melody Maker." Tens of thousands have already been built—manufacturers of components specified are all working at top speed to keep pace with the phenomenal demand. Many shops have a waiting list of customers wanting to buy the parts for the Cossor "Melody Maker." It's the sensation of the season. And a large share of this success is due to its Cossor Valves. Without Cossor Valves there could have been no Cossor "Melody Maker." No matter which type of Set you are using you'll get better results with Cossor Valves.

FREE

Send a postcard for a copy of the full size chart "How to build the wonderful Cossor "Melody Maker." As simple as Meccano. No soldering. Every wire shown full size, numbered and bent to shape. Impossible to go wrong. Success guaranteed. Build it in an evening. Gets Broadcasting from six countries. Mark your postcard Dept. P.W. A. C. Cossor, Ltd., Highbury Grove, London, N.5.

FOR YOUR POCKET'S SAKE, DEMAND

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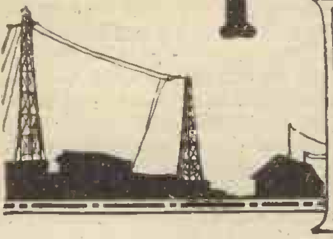
CA 1063

Popular Wireless



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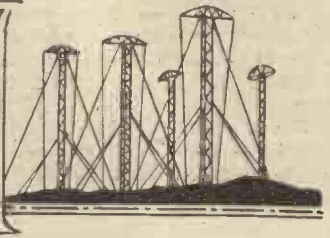


RADIO NOTES AND NEWS.

Pure Brass—The All-Black Route—P C J J—Broadcasting Times—Transmitting Notes—An Astounding Admission—Less Than Nothing.

Pure Brass.

FOR pure untarnishable brass I recommend you to a gentleman whose letter I have seen in a North Country newspaper. He has a crystal set, but threatens to let his licence lapse because of the behaviour of niggardly valve-set owners who are low-down enough to tune away from the local station, thus depriving him of the benefits of re-radiation. The remedy is the "P. W." "Every Purpose."

The All-Black Route.

W. H. B. (Heathfield), who gets Sydney (N.S.W.) on the above set, which he votes "the best ever," winds up his letter with a poser. If all his questions are equally nasty, I fear he will be hounded out of society. "Which way round does Sydney come?" It would take a cleverer man than Ariel to say, but my understanding is that it comes all ways at once, but so much more strongly over that part of the earth which is in darkness that the other ways don't count. Hence, generally speaking, it comes round one way by day and the opposite way by night.

The Radio Car Returns.

GLAD to hear that Captain L. F. Plugge has returned safely from his motor tour through France, Portugal, and Spain. A good example of the advantage of a radio-fitted car was supplied by the fact that whilst *en route* he picked up an S O.S. for one of his party whose father was seriously ill, and who was thus warned to return without the delay which, but for the radio, would have occurred. Captain Plugge thinks the Portuguese roads need plugging. They do. They are simply a string of pot-holes joined by mud and stones.

The League and Radio.

IT is not surprising that the League of Nations has felt the need of its own wireless station, radio being such a fine instrument for propaganda. I understand that the Swiss Marconi Company has decided to build a new high-power station, 50 kilowatts to the anodes, capable of reaching all places in Europe, North Africa and the East. I expect this will interest ex-Uncle Arthur R. Burrows, who is now posted in Geneva.

P C J J

NOW that this famous station is being dismantled and re-erected at Hilversum, a brief review of its work may not be amiss, for it has certainly made radio history and given the B.B.C. the jog of its life. It began by working on 30·2 metres, when Australia spoke very well of its signals. Then, on May 20th, 1927, it had the audacity to relay Daventry, its signals being well received in Australia, New Zealand, India and South Africa.

The Great Debt.

P C J J transmitted a special Beethoven programme which was received all over the world and was even relayed by other stations. On March 11th, 1927, it established telephonic communication with Bandoeng, Java, and on May 31st, 1927, Queen Wilhelmina and Princess Juliana addressed the Dutch Indies through P C J J Finally, on August 14th, 1927, the Australian High Commissioner in London spoke to Australia through Eindhoven, where the Philips' experimental station was at that time. But the great debt owing to P C J J is that it woke up the B.B.C. with a start, because it showed what could be done.

News from Ireland.

OFFICIAL figures show that the value of Irish imports of sets and parts for the half-year ending June 30th was £35,307, as against £58,662 for the same period last year. Of these imports England supplied £33,730 and Northern Ireland £549.

(Continued on next page.)

WIRELESS ON AN INLAND WATERWAY.

Mr. Percival Westerman (right), the author of many popular sea stories, has radio fitted upon the barge in which he traverses the inland waterways.

NOTES AND NEWS.

(Continued from previous page.)

The Washington Conference.

I HAVE received news that the Conference decided to abolish spark transmitters. I do not know what period will be allowed, but anyhow, it is good news for many Morse-haunted listeners. The wavebands alloted to amateur transmitters are (in metres): 150 to 174·927; 75 to 85·714; 41·096 to 42·857; 20·833 to 21·429; 10 to 10·714; 5 to 5·37. The band 0 to 5 is allotted to no one in particular.

Broadcasting Times.

IT is extremely difficult to get information about short-wave transmission times, probably because so many of the stations are experimental. However, here goes! Cincinnati, W L W, 52·02. Relays programme at 11.5 A.M. G.M.T. 2 X A D, 21·98, Tuesday, 9 to 9.40 A.M. Also transmits evening programme of W G Y on Sunday, Monday, Wednesday and Friday. Rocky Point, 2 X G, 16·02, Monday and Friday, after 5 P.M. Radio Malabar, A N H, 17·3, Monday, Wednesday Friday, 7 A.M. to noon; Tuesday, Thursday, Saturday, noon to 5 P.M. (E H 9 OC relays Berne programmes at 7.30 P.M. and 9.45 P.M.)

Station News.

A NEW station at Laibach, Jugo-Slavia, is expected to be ready by Easter. In due time you can Laibach and tune for it. In order to minimise the interference from Australian stations and the new high-power station at Wellington, new wave-lengths have been allocated to the New Zealand broadcasting stations, as follow: 1 Y A, 333 metres; 2 Y A, 420 metres; 3 Y A, 306 metres; 4 Y A, 363 metres.

North London Club.

A wireless club is to be formed at the Holloway Literary Evening Institute, Holloway County Secondary School, Hilldrop Road, Camden Town, N.7, meeting on Mondays at 7.30 p.m., and conducted by Capt. Jack Frost, formerly of the B.B.C. Membership fee, 4s., November to Easter. This is going to be a live affair, with lantern lectures and demonstrations galore, and will look after beginners as well as experts. So pack up your radio troubles in your old kit bag—and go to Holloway.

Birmingham Club.

A WIRELESS society, "Slade Radio," a branch of the Wireless League, has been formed at Erdington. Membership includes that of Wireless League. An experimental station is being provided, besides lectures and demonstrations. Hon. Sec., Mr. H. Clews, 52, St. Thomas Road, Erdington, Birmingham.

Another Society Note.

THE Southport and District Radio Society (Hon. Sec., Mr. E. C. Wilson, [illegible], Hampton Road, Southport) held its third annual exhibition from November 7th–November 12th. Somehow or other I did not receive sufficient notice of this to permit me to publish the news in advance. Club secretaries will take warning by this, and let me know about their special "doings" as far in advance as possible. This club is not a dull emitter by any means, and judging by its exhibition programme it is run by what Uncle Sam would call "go getters." The fee is 5/- per annum and the present session alone is worth double.

Transmitting Notes.

STATION 6 Y F is now on the ether, 45 metres. The owner would welcome reports, particularly about his "keying chirp." Address, 6 Y F, 38, Barrow Hill Road, St. John's Wood, N.W.8. Mr. J. N. Roe, "Mirydon," Ridgeway Road, Farnham, Surrey, is now operating Radio G–2 B U W on an artificial aerial. He is a nice man, because he says he reads "Notes and News" first, and because he wants to help anybody with tests, especially on short waves. On a modified "Simmonds" he gets 2 M E and 2 F C, at R 5 in the phones.

Changed Call-Signal.

SIR. H. T. HUMPHRIES, Carrick House, 7, Elmwood Road, Herne Hill, S.E.24, states that he has changed his call-signal from 2 Z W X to 6 Q J. He transmits on metres 45, 90, 150 and 200 and will be pleased to arrange tests with any other transmitter in the British Isles.

SHORT WAVES.

"How to obtain volume on your wireless." Place a book on it.—"Daily Mirror."

* * *

A PICK-ME-UP.

"I'm feeling very run down," said the accumulator.

"Well, come and have a spot," said the crystal.

* * *

Wireless beats time, not with the baton, but by the variation of the clock every time listeners in Great Britain hear the relay of a programme from Australia.—"News of the World."

* * *

Dear Old Lady (writing to the B.B.C.): ". . . and will you please send me the pamphlet telling me how to osculate."—"Weekly Record and Mail."

* * *

THE BLESSINGS OF RADIO.

An intelligent appreciation of radio is shown in a letter received recently by the B.B.C.: "And the classical music is so soothing. Grandma sleeps peacefully through it every evening, so I do not have to stay with her but can go out for a game of billiards."

* * *

Once people who talked to themselves were thought to be evincing the first signs of insanity. Nowadays they're known as radio lecturers.

* * *

A STANDING BUY.

Teacher: "If your father bought a sixty-dollar radio set on the instalment plan, and paid off two dollars a week, how long would it take him to pay it off?"

Jimmy: "Ten years."

Teacher: "Sit down, you don't know the lesson."

Jimmy: "You don't know my father!"—"Radio News."

* * *

A thought for to-day: To be successful in life you must keep on climbing, and when you have reached the top of the ladder you will probably remember you left the aerial wire down on the ground.

Correct Dress for Amateurs.

A WRITER of wireless notes in a very well-known "daily," in dealing with "hand-capacity" effects, recommends the wearing of rubber gloves when tuning. This is very old-fashioned. Everyone knows that the proper costume is a straw hat, morning coat, flannel bags, carpet slippers and calabash pipe; spats optional. But, joking apart, for the information of technical readers I would ask my friend, who is, I see, an A.Rad.A.—nothing to do with radishes—why he prefers to use a rubber dielectric for his "hand capacity" rather than the more usual dielectric of air. It's much more expensive and the results are no better.

Less than Nothing.

JUST one more technical hint, this time from a Leeds paper. The expert, trying to explain an oscillating current, says, "That is how the current continues. From zero, it continues its progress until it reaches *its lowest power* (minimum potential), which is just equal and opposite in value to its highest power." The italics are mine, because I want you to note that when the current has a *minimum* value, *lower than zero*, it is equal in power to its *highest* power. Gentlemen, bare your heads, for this is a miracle. Zero will have to pack up and go out of business.

Three Items to Note.

DECEMBER 2nd, Comic opera, "Rose of Persia," by Sullivan. 2 L O and 5 X X. December 6th, A party of the Victorian days, from Birmingham. Shades of musical chairs, Family Coach and Postman's Knock! December 7th, The opera, "The Travelling Companion," by C. Villiers Stanford, from Cardiff.

An Astounding Admission.

WHEN I read that, speaking at Manchester on November 10th, Sir John Reith admitted that the "Children's Hour" and Variety Entertainments (by the B.B.C.) are "dreadful," I oscillated so violently that my equilibrium was half a degree to starboard for several days. I hope Sir John was correctly reported and that his utterance is proof of heart-searching by the B.B.C.

The Public Knows.

INTERESTING results have come from a questionnaire circulated to listeners in America, with the object of finding out their favourite composer and type of music. Beethoven was top of the list and Schubert second; the third was Victor Herbert, an American composer. Well, if a public that puts Beethoven first puts Herbert third we ought to hear Herbert. Has the B.B.C. ever broadcast any of his work? The overture to "Tannhauser" came first for the second question, "Poet and Peasant" (Suppe) second, with "Marche Militaire" (Schubert) third. No English composer was mentioned, though "H.M.S. Pinafore" was ninth of ten favourite pieces.

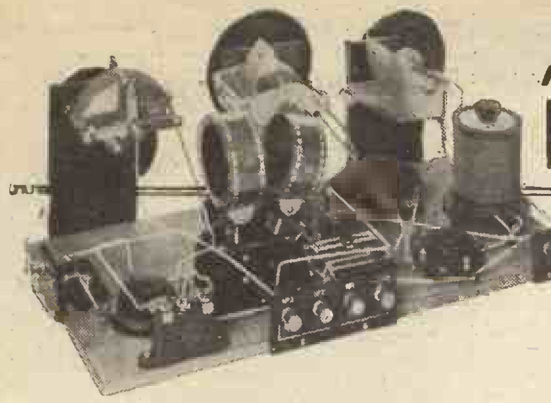
American Radio Fun.

FROM "Radio News." Neighbour: "How many controls are there on your radio set?" Owner: "Three; mother-in-law, wife, and daughter." And again. Sonny: "Daddy, mother wants you to look at a spider's web before she brushes it away." Daddy: "What's wonderful about it?" Sonny: "She's afraid it's a part of your radio set."

Talks from Paris.

THE University Extension of the "Institut Radiophonique," Paris, has arranged a weekly talk from Eiffel Tower and P.T.T. on "New Books in English," given by Miss Golda M. Goldman. As these talks are under the auspices of the Sorbonne they are almost certain to be worth while, and may repay you for troubling to pick up Paris. The talks are in English.

ARIEL.



A NEW CONSTANT—REACTION CIRCUIT

Mr. P. W. Harris here gives the first published description of a new and very interesting circuit. It has been tested thoroughly and would appear to be the most practical solution of the problem of "constant sensitivity" yet brought forward. Next week a simple two-valver incorporating this novel scheme will be detailed in full.

By PERCY W. HARRIS, M.I.R.E.

EVER since the valuable properties of reaction were first made known there has been a constant endeavour to evolve a circuit which would give constant reaction over the whole tuning scale, in other words, a circuit in which a reaction setting for maximum sensitiveness made at any one point of the tuning scale would remain unchanged for any other tuning position.

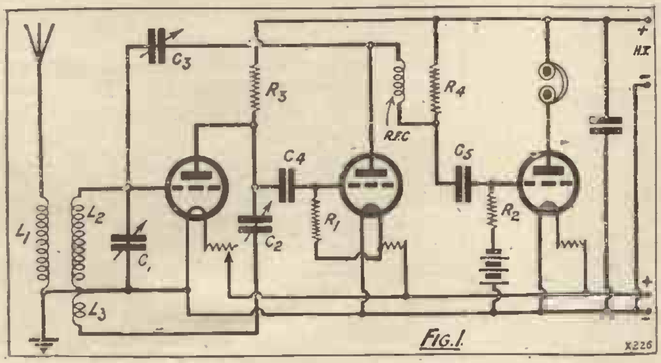


FIG. 1.

With all ordinary reaction circuits, more reaction is required at the top of the tuning scale than at the bottom, and as we increase the wave-length setting of our receiver, we must steadily increase the reaction coupling to maintain the same sensitivity.

Although many attempts have been made to evolve constant reaction circuits comparatively few have had any practical value. Certain mechanical arrangements in which the coupling between the reaction coil and the grid coil has been continuously varied as the tuning condenser spindle is turned, have proved fairly successful, but require special apparatus and have been none too easy to manufacture.

Resistance Coupling.

One of the most successful of the non-mechanical schemes is that put forward by Loftin and White, and previously described in this journal. In this, the increasing efficiency of capacitative coupling with increase of wave-length is balanced against the decreasing efficiency of inductive coupling with increase of wave-length, and a fairly constant feed-back of energy over the whole scale can be obtained.

The Loftin-White constant-reaction scheme, although giving great promise when first tried, has proved in practice to be rather troublesome and has not achieved any great popularity.

My new constant-reaction scheme is quite different from the Loftin and White method. It is the result of a number of experiments conducted to find methods of applying the new high-magnification R.C. valve to high-frequency work. An article on this subject has appeared in POPULAR WIRELESS, No. 266, under the title, "Bringing in Daventry and Co." Here I showed that a very good measure of success was obtainable on the Daventry Range and that distinct amplification, although of a smaller order, was also obtainable on the broadcast range.

If readers will refer to this article they will find a detailed description of experiments with reaction control from the plate of the detector valve to the grid circuit of the high-frequency valve, extremely small capacities being sufficient to feed back the energy required to produce oscillation.

The continuance of these experiments with the object of finding some method of obtaining sufficient feed-back to produce smoothly-controlled reaction on the broadcast band has had very interesting results, and has led to a new circuit being evolved using a high-frequency stage, and a detector (followed, of course, by one or two stages of note magnification, if desired), with only one tuning condenser and a reaction scheme which gives constant reaction control over the whole tuning band. This means, of course, that we have now the true single condenser, single-dial set, including a stage of high frequency—a most desirable state of affairs.

The circuit itself, for which a patent application has been filed, is shown in Fig. 1. It is made up in this case, as a three-valve set. The high-frequency valve is coupled to the aerial with a standard six-pin Reinartz transformer, reaction being obtained with the aid of the winding L_3, and the condenser C_2. This high-frequency valve is coupled to the detector valve by the resistance R_3. and condenser C_4, the grid leak R_1 being joined to the positive leg of the valve in the usual way. Following the detector valve we have a radio-frequency choke, anode resistance R_4, and coupling condenser C_5, with the grid leak R_2.

Constant Sensitivity.

The interesting part of this circuit is, of course, that which gives the constant reaction coupling. This is the combination of condenser C_3 joining the plate of the detector valve to the grid of the high-frequency valve and the condenser C_2, with the winding L_3. Ignoring the coupling given by the condenser C_3, and considering only the ordinary reaction control on the high-frequency valve, consisting of the condenser C_2 and the coil L_3, we shall find that if the circuit is arranged so as to be just on the oscillation point when the condenser C_1 is at its minimum, a steady

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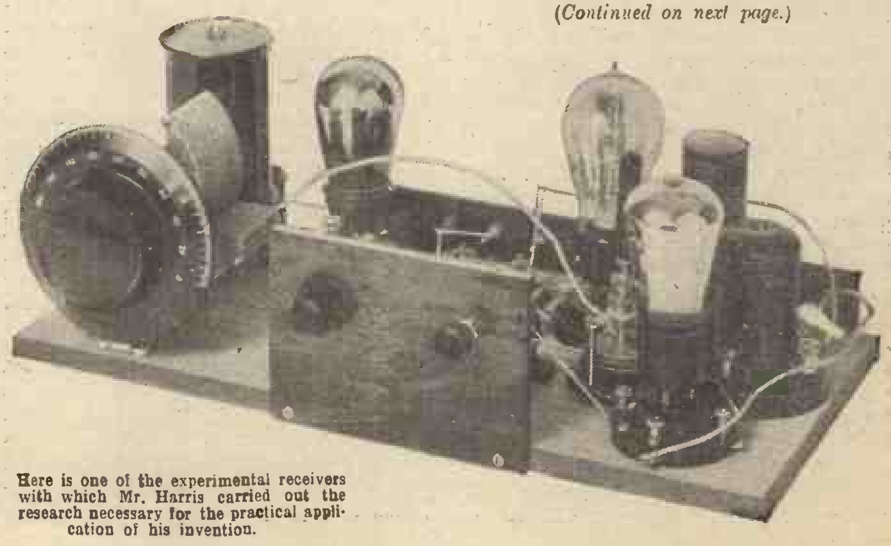


Here is one of the experimental receivers with which Mr. Harris carried out the research necessary for the practical application of his invention.

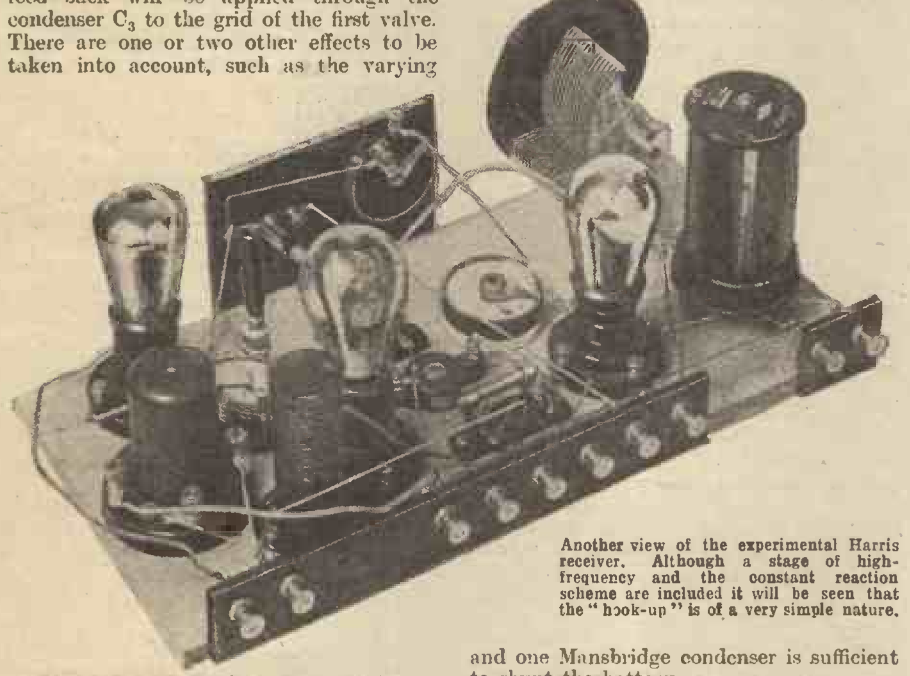
A NEW CONSTANT-REACTION CIRCUIT.

(Continued from previous page.)

increase of capacity of C_2 will be required to bring the set to the point just below oscillation as we increase the reading of C_1. Briefly put, we can say that we must increase reaction as we increase wave-length for this circuit.

Now consider the radio-frequency coupling produced by the resistance R_3 and the condenser C_4. It is well known that the efficiency of resistance coupling goes up as we increase the wave-length. We shall, therefore, get a greater step up in amplification as we increase the wave-length to which the set is tuned, the sole tuning control in this case being the condenser C_1 in the first grid circuit.

For a given setting of C_3 there will be a certain amount of feed-back from the detector to the first valve. Owing to the increase of amplification as we increase the wave-length of the circuit, an increase in feed-back will be applied through the condenser C_3 to the grid of the first valve. There are one or two other effects to be taken into account, such as the varying reactance of C_3, but these do not substantially effect the general working.



Another view of the experimental Harris receiver. Although a stage of high-frequency and the constant reaction scheme are included it will be seen that the "hook-up" is of a very simple nature.

If, now, we adjust the values of C_2 and C_3 so that the increase of feed-back by one is balanced by the decrease of feed-back of the other, we shall have achieved constant reaction. This is what we do. Such an adjustment is quite simple to effect in practice, as will be explained later. The result is that we have a sharp tuning circuit possessing high selectivity and sensitivity, with a single-tuning control, using no ganged condenser or other complication.

Low Cost.

If the set is made up with a resistance-coupled audio-frequency stage, as well as resistance-coupled radio-frequency stage, the cost is extremely low, for the resistances R_3 and R_4 need only be ¼-megohm grid leaks of good quality. In fact, the resistance R_4, condenser C_5, and grid leak R_2 can, in combination, be one of the very inexpensive R.C. units now sold.

It is not possible to use such an R.C. unit for the radio-frequency stage, as the value of the coupling condenser in such a unit is designed for audio-frequency work and not for radio-frequency coupling. R_3 can be a ¼-megohm grid leak, and R_1 a 2-megohm leak, while C_4 can be the usual ·0003 mfd. grid condenser.

L_1, L_2 and L_3 together, form a standard six-pin Reinartz transformer for the lower broadcast band, and the condenser C_3 should be a smoothly adjustable neutrodyne with a very low minimum. C_2 should be a ·0001 mfd. maximum variable condenser, one of the midget types suiting excellently for this purpose, although the maximum value of some of the neutralising condensers will be sufficient for this.

L.F. Easily Added.

The condenser C_1 should have a value of ·0005 mfd., and both first and second valves should be of the R.C. type. The third valve should be a small power valve or better, a super-power valve, if you have very loud signals to deal with. Only one high-tension tapping is required for such a circuit, which, again, makes for simplicity, and one Mansbridge condenser is sufficient to shunt the battery.

A few experiments with a set which can easily be made up on a board in an experimental form, and will soon show the remarkable capabilities of the set. The experimental board used for trying out the arrangement described is shown in the photographs, although it is not wired up in the final form which has been discovered to be best. A theoretical diagram of how to connect up your components is given in Fig. 1, and having grasped the principle readers may like to devise sundry modifications to suit their own conditions. Very shortly I will give you a design for a finished set, using this circuit.

Of course, it is a simple matter to add a further stage of note magnification to the circuit given, and this should preferably be transformer coupled. It is not recommended to follow the detector-valve arrangement with transformer coupling, as it is obviously advisable to use a high-impedance R.C. valve for the detector.

MAKING RADIO CABINETS.

THE problem of making cabinets for wireless sets and other apparatus is not easily solved, for when made the trouble is not ended—how is it to be finished, what varnish, what stain?

I always make my cabinets from ¼-in. mahogany. This wood I find is most suitable, being not too hard to work with ease and yet capable of taking a nice finish. The corners are halved, glued and nailed with oval brads which can be punched out of sight. The reader will know what he should make the length of the pieces of wood which are to form the sides of the cabinet. The bottom piece of wood is made ¼-in. bigger all round than the bottom of the cabinet, and the edges are bevelled before fixing. It is advisable to smooth all the faces and edges, that will be exposed, with fairly coarse glass-paper before assembling. When the glue has set hard, the corners are trimmed first with a rasp and then with a file, the nails punched below the surface, and the holes stopped with bees-wax. Finally, the whole is smoothed with fine glasspaper.

Finishing Off.

The first coat to be given is one of gold size, obtainable at any paint merchants. This brings the colour of the wood out and fills in the pores of the wood. When this is hard the cabinet is smoothed with the fine glasspaper again, and another coat of the size given. This is followed by two coats of colourless varnish, the wood being smoothed before each coat.

Mahogany treated thus will have a light brown colour and a good surface. It will not have the dark "japanned" look of the bought cabinet. If the reader desires to darken the wood, a coat of stain (black enamel diluted with turps put on very thinly will do) should be applied before the gold size. C. M. B.

R.C. & SELECTIVITY

PROBABLY not many realise that the use of resistance-capacity amplification after the detector valve (in sets which incorporate no H.F.) materially improves selectivity. One sometimes finds a set with a very high magnification valve as detector (on account of the use of resistance-capacity amplification) which, with a direct-coupled aerial and no reaction, is more selective than the average oscillating detector. This is, of course, on account of the very high grid-to-filament impedance of valves of this type, which therefore constitutes a much smaller source of damping across the secondary or A.T.I.

It often pays to change the first L.F. from transformer to resistance coupling, simply so that one can profitably use one of these high-impedance valves (60,000 ohms or so) and obtain the resultant improvement in selectivity.

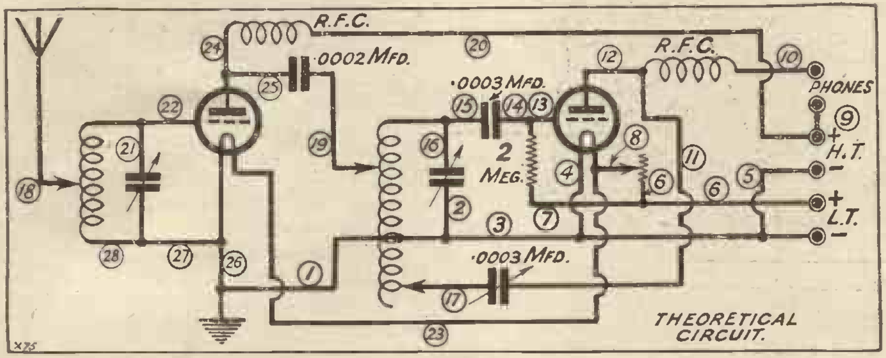
L. H. T.

The PROGRESSIVE TWO

Last week's one-valver becomes a two-valver without altering any of the existing leads or components.

By G. V. DOWDING, Grad.I.E.E.
(Technical Editor.)

WELL, have all you constructors had that one-valver going really well? If you have, then you can carry on with this week's work and bring the set up to the full two-valve stage. Not a single component will have to be moved and not one of the leads will have to be replaced. Everything is purely addition and you will have the satisfaction of knowing that the efficiency of the detector stage will be unimpaired. Your H.F. stage will not be camouflaging any faults, and when it is operating properly you will have a real "DX" two-valver going.



THEORETICAL CIRCUIT.

Have a look at the accompanying theoretical diagram. You will see that the present aerial coil becomes a tuned grid coil. A new coil is brought in to tune the aerial and this is connected to the grid of the high-frequency amplifying valve. To this new coil the flexible wire connected to the aerial terminal is now joined, a fresh flexible being introduced to take its place on the grid coil.

Sensitive, Selective and Stable.

This H.F. coupling method is sometimes alluded to as the "tuned grid" and sometimes as the "shunt" system. Actually, of course, it is a choke-capacity coupling with the addition of a tuned grid circuit in the detector input. It is a very efficient method and is particularly suitable for such a set as this. It is sensitive and selective and distinctly stable. I am not going to say that it is preferable to some of the modern methods from every point of view although, undoubtedly, its simplicity makes it more generally reliable.

It is debatable whether the results given by that type of circuit in which something is introduced to overcome something and something else brought in to overcome some effects due to the use of the first something, and so on, are really so wonderful after all. It is my opinion that many technicians are in danger of losing their heads with such intriguing complications, and it is a cast-iron fact that a very high percentage of the more spectacular performances recorded by

COMPONENTS REQUIRED.

The additional components you will need in order to add an H.F. stage to the "Progressive" One are as follows:

1 ·0005 mfd. variable condenser (preferably with a slow-motion control, although this is not essential). (Any good make. Original was a Brandes.)
1 H.F. choke (Any good make).
1 Baseboard-mounting single-coil holder (L. & P., Lotus, Peto-Scott, etc.).
1 Valve holder for baseboard mounting (Any good make).
1 ·0002 mfd. fixed condenser (Clarke, Dubilier, Lissen, Mullard, T.C.C., etc.)
Terminals, wire, etc.

You should read the article carefully before purchasing any of the above parts.

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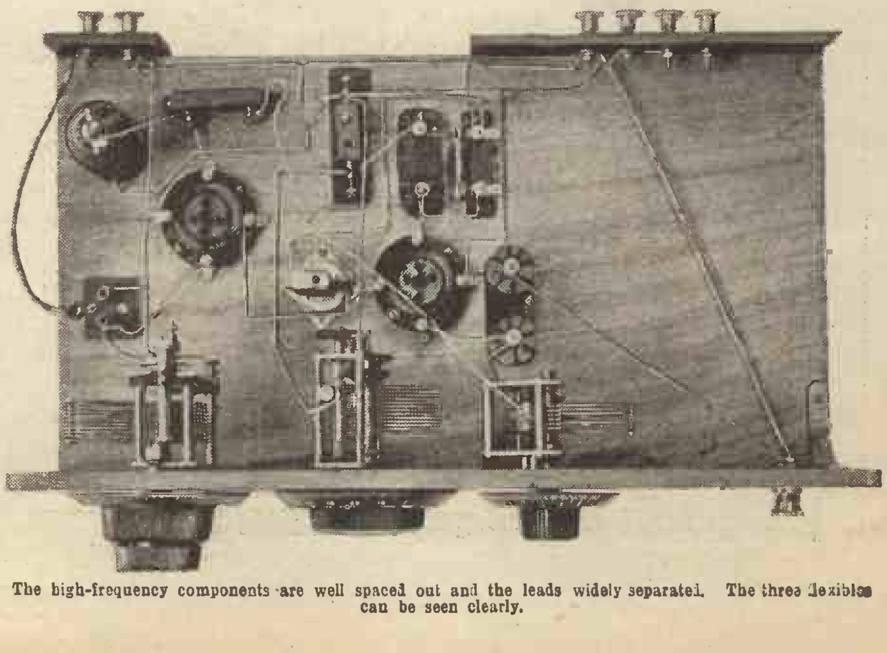

The high-frequency components are well spaced out and the leads widely separated. The three flexibles can be seen clearly.

THE "PROGRESSIVE" TWO.

(Continued from previous page.)

readers are achieved with the simplest of apparatus.

However, with one stage of high-frequency amplification, problems which have to be faced in the case of multi-stage amplifiers do not have to be taken into consideration. Stray capacities and weird coupling effects are seldom troublesome, and stability does not have to be obtained by the sacrifice of sensitivity. And the circuit employed in our two-valve "Progressive" is a happy one judged from these angles, inasmuch as the plates of both the valves are isolated from the common H.T. supply by the interposition of H.F. chokes necessary for quite another purpose. This is going to help us considerably on our L.F. side, too, and will make for purity of reproduction.

WIRING INSTRUCTIONS.

Join a flexible lead to one terminal of ·0002 mfd. fixed condenser (19).

Join one terminal of new H.F. choke to H.T. + terminal (20).

Join one terminal of new ·0005 mfd. variable condenser to one side of new coil holder (21).

Join same side of new coil holder to grid socket of new valve holder (22).

Join one filament socket of new valve holder to terminal of filament resistor nearest other valve holder (23).

Join remaining side of H.F. choke to remaining side of ·0002 mfd. fixed condenser (24), this same side of fixed condenser is then connected to plate socket of valve holder (25). (In such cases the one piece of wire can be carried on to make the two leads.)

Join the Earth terminal to remaining filament socket of new valve holder (26) and carry lead on from this point to remaining side of new ·0005 mfd. variable (27).

Join a short lead (28) to other side of new coil holder and to lead No. 27.

You will not require much stuff for this H.F. stage. Another ·0005 mfd. variable condenser is required, and this should preferably be fitted with a slow-motion control. Then one more H.F. choke is needed, and this can be of any good make. The baseboard-mounting coil holder, valve holder and 0002 mfd. fixed condenser complete the list and are items of a very simple, straightforward nature.

Very Simple Task.

Constructionally speaking, this week's labours are so easy that you will almost be able to carry on without any further assistance than that provided by the diagrams and photographs. One light and interesting evening's work should see the task comfortably concluded.

One hole must be bored in the panel for the variable condenser in the position indicated in the appropriate diagram. Now I must point out here that if you buy condensers of a different type to those used in the photographed set, it may be necessary to vary the

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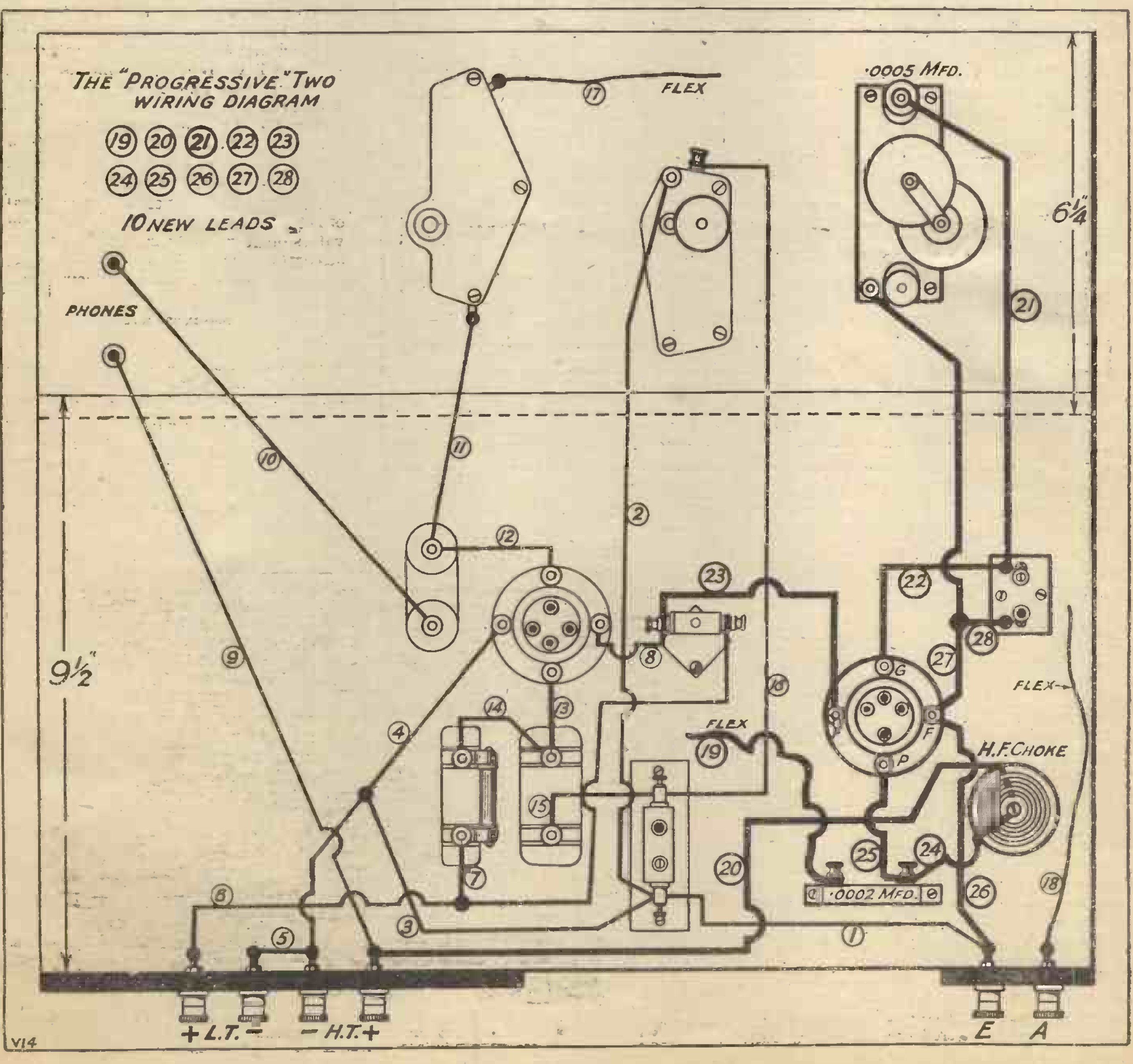
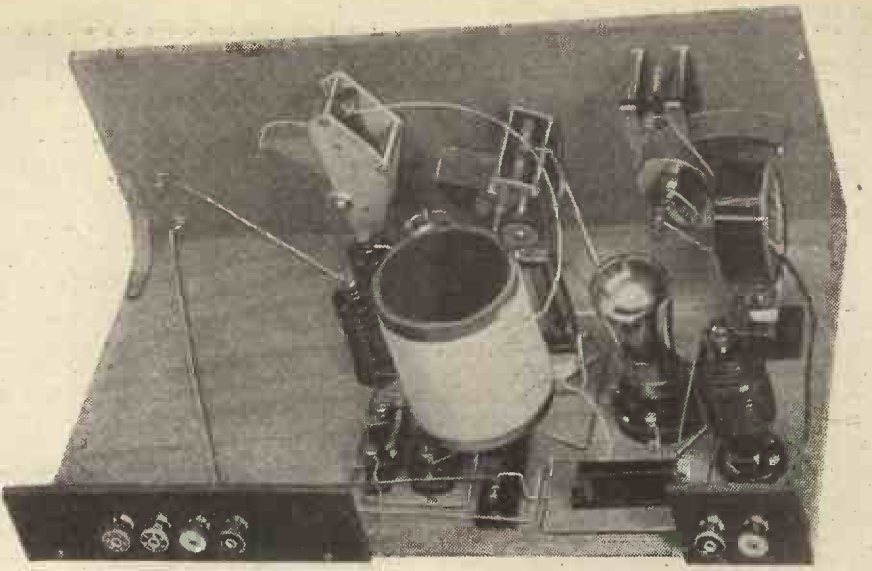


THE "PROGRESSIVE" TWO.

(*Continued from previous page.*)

panel drilling slightly in order to retain uniformity. But you will see this for yourselves. The only essential thing to note here is that the vanes of the variables must clear the adjacent variables by at least an inch and must also clear the wiring and any of the other components.

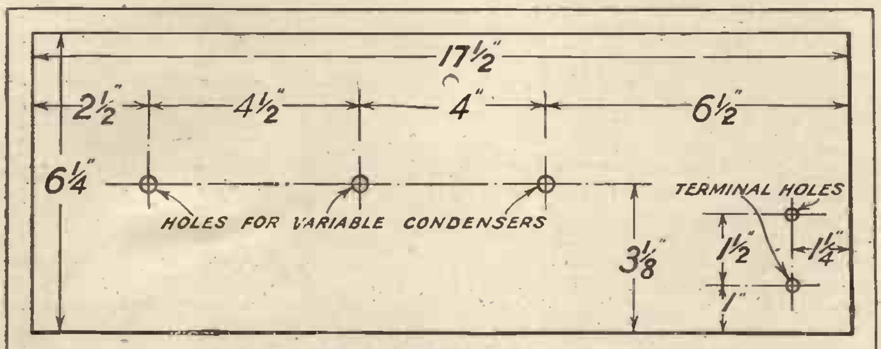
Having fixed the new variable in position, the other four new components can be screwed down on the baseboard in the approximate positions shown in the photographs.



Here the "Progressive" Two is shown with its coils and valves in position.

The New Leads.

You will notice that the wiring diagram has been drawn so that the additional components and wiring stand out much blacker than the existing parts. The numbers carry straight on. No. 18, the flexible lead attached to the aerial terminal, remains so connected, but this will be joined to the aerial coil instead of to what now becomes the grid coil. A new flexible (shown as No. 19) is joined to one terminal of the ·0002 mfd. fixed condenser and this is connected to one of those points on what is now the grid coil and to which formerly the No. 18 lead was taken. I hope I have made this quite clear, because this is the only point which can possibly cause confusion.



PANEL DRILLING DIAGRAM.

The one filament resistor is going to be made to serve both the valves, so that a lead (No. 23) is taken from one of the filament sockets of the new valve holder to one terminal of the filament resistor. No. 27 lead, which joins one terminal of the variable condenser to the other filament socket of the valve holder, carries on as No. 26 lead to the earth terminal. The earth terminal is joined via another lead to the H.T. minus terminal, and in this way the filament circuit of the H.F. valve is completed with an economy in leads.

The longest lead is No. 20 and as this carries high-tension current, care should be taken that it is clear of everything else on its route and has, in the bargain, nice margins. Make sure that even should the set receive a heavy blow, this lead will not sway into contact with anything, more especially other leads connected with either of the L.T. terminals. Again, I would advise you to keep the wiring low down, but not so low that it touches the baseboard. Low wiring is both neater and safer.

Don't forget to cross out the appropriate numbers in the left-hand corner of the wiring diagram as the leads are joined up, for by so doing you will automatically be checking your work.

You will want another coil to occupy the new coil holder. A Lissen "X" No. 60 or an "Atlas" No. 60 tapped coil will cover the lower wave-band while 5 X X coils in both types are available. The flexible lead joined to the aerial terminal is taken to the terminal fitted on the aerial coil. A 60-turn spiderweb coil can be wound by the constructor himself quite easily. A tapping should be taken at a central point. It may be found that the flexible lead is rather long now that it is taken to a somewhat nearer point. In this case it can, of course, be shortened.

Now for the operational details of this two-valver. The same H.T. and L.T. will be O.K. and a similar sort of valve to that used in the detector will prove quite suitable. This, you will remember, was an H.F. valve of not too high an impedance. One of these valves ranging around 20,000 ohms function admirably. These are generally designated as "H.F. and Detector" on their boxes.

Operating Notes.

You may find that the set will oscillate somewhat easier now that the H.F. stage is added, and it may prove necessary to lower the lead from the reaction control variable to the tapping on the grid coil third or fourth from the top. Also, the H.T. may, with advantage, be lowered slightly.

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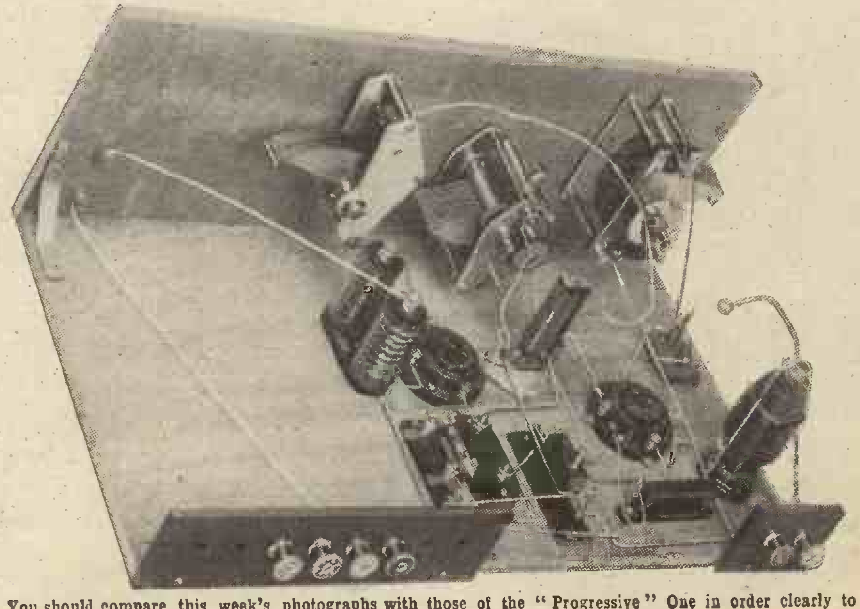


You should compare this week's photographs with those of the "Progressive" One in order clearly to identify the new components.

CURRENT TOPICS.

THE R.S.G.B. AND "Q.S.T."

An Explanation—The Position of the Wireless Societies.

By THE EDITOR.

THE Secretary-Editor of the Radio Society of Great Britain has forwarded us the November issue of the T. & R. Bulletin. He draws our attention to the editorial published in this number, which he hopes will clear up the matter on which an article in "Q.S.T." gave rise to discussion some weeks ago.

The editorial points out that in the first place it must be clearly understood that the British delegates to the conference at Washington were Government officials and, as such, their utterances and representations are those which might be expected from official sources. The British amateur had no place in the delegation, and was not invited to submit his views.

"Sadly Misinformed."

It appears that the President of the Society was assured by the Postmaster-General's department that the needs of British amateurs would be borne in mind at the Conference. The editorial seems to support the view that even if a British amateur of the Radio Society of Great Britain had wanted to attend the Conference he could not have done so.

We have no means at the moment of checking this view, but we feel sure that, just as Captain Eckersley visited the Conference in an advisory capacity, so could a member of the Radio Society of Great Britain have attended the Conference in an unofficial but advisory capacity.

As it is, the T. & R. Bulletin editorial states that eventually it was agreed that Mr. Warner, secretary of the International Amateur Radio League, and Mr. Maxim, the president of the League, should represent British amateurs at the Conference.

The editorial continues as follows:

"What cannot be understood, however, are the statements made by the British delegates at the preliminary meeting in Canada, which is reported by Mr. Warner in his editorial. As predicted by Mr. Warner, the affected ignorance of the delegation as regards the strength of amateur radio in America and at home here 'fair makes our hair stand on end.' We know that copies of the Bulletin find their way into the office of the Postmaster-General and his assistants, and for the delegates to display such ignorance merely proves that the delegation has been sadly misinformed as to the position both here and abroad. . . .

R.S.G.B.'s Explanation.

"The blame for such a position entirely rests with the authorities responsible, for nobody who has lived in this country for the past ten years and who has been associated with radio can possibly have failed to note the influence of the amateur on the progress of the art."

That, briefly, is the explanation offered by the T. & R. Bulletin, published by the Radio Society of Great Britain, as to the reason why British amateurs were not represented at the Conference.

We do not consider that the explanation fully exculpates the Radio Society of Great Britain. If their request for permission to attend the Conference officially was denied, then why in the name of—amateur radio, let us say—did they not have the sense to drag the matter out into the light of day?

If the Post Office has bamboozled the Radio Society of Great Britain into the acceptance of the view that the British delegates chiefly sent by the Post Office were sufficient to deal with matters at the Conference, then the Radio Society of Great Britain took this dictum very quietly, for it is the first we have heard about it—and, we venture to say, the first the general public have heard about it, and that includes many thousands of amateurs.

Not Strong Enough.

The trouble is that the Radio Society of Great Britain is not strong enough and not alive enough to press home its justifiable claims; and, in any case, the British Postmaster-General has no power to prevent a member of the Radio Society of Great Britain from being present at the Conference, where a competent man in informal talks with the other delegates could have done far more to make known the real position of the British amateur and his needs than an American amateur temporarily invested with the right to speak on behalf of British amateurs.

As this article is written we learn that the Wireless League and the Wireless Association have amalgamated. That is good news; it would be even better news if the Radio Association and the Wireless League joined up with the R.S.G.B.; or if these societies were put into the melting-pot, re-cast, and a new and energetic society created.

Even with the necessary funds, we doubt whether the R.S.G.B. is competent to represent the British amateur movement. Its work, so far, has been for the few: undue emphasis has been laid on the amateur transmitter, and there has grown up a sort of legend that the only *bona fide* experimenter in radio is the man who has a transmitter.

Nothing of the sort. There are many thousands of *bona fide* experimenters who do not own transmitting stations—and they are not catered for, in an adequate way, by any existing society.

Amalgamation Wanted.

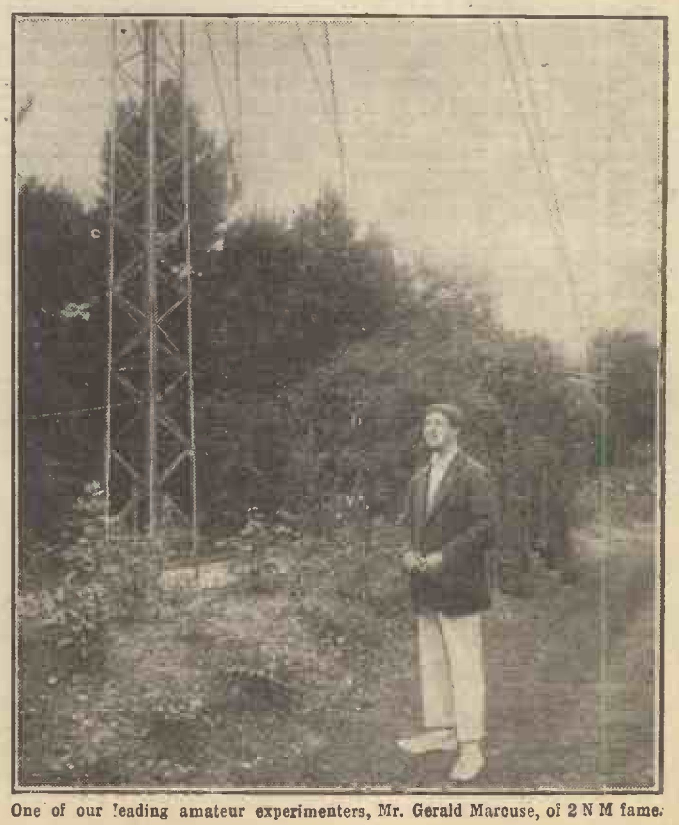
Insurance policies, legal advice, etc., are no doubt very useful items in the service list of a wireless society, but by no means of paramount importance; and as there are competitive societies, each having its own methods and each claiming to represent the listener and the amateur, the result is a lack of unity among amateurs and a weak defence when dealing with questions of real importance to the status and privileges of amateurs.

We hope that the R.S.G.B., as the oldest wireless society, will take the lead in this matter, and will open up negotiations with the Wireless League and the Radio Association with a view to complete amalgamation. United they might be of some use, divided, they never will be.

Complete Re-casting Required.

We suggest a round table conference and the re-casting of the R.S.G.B., followed by an intensive campaign for the greater enlargement of the membership list, and a consequent increase in the vitality, strength and importance of the executive committee.

We offer to help to the best of our ability, and the editorial pages of "P.W." and its contemporaries published at this office will be open to the council of the R.S.G.B. for the purposes of making known any attempt to be made to make the R.S.G.B. a real and useful force existing for the avowed object of serving the British amateur.



One of our leading amateur experimenters, Mr. Gerald Marcuse, of 2 N M fame.

"Why I Don't Broadcast—!"

An interesting explanation and a few words about Broadcasting in general by CHALIAPINE, the great Russian basso, in an interview with "Ariel."

CHALIAPINE is, admittedly, one of the biggest musical attractions in the world. For this there are at least two reasons. In the first place he is certainly the greatest bass vocalist which this generation has produced and, secondly, he is a unique personality—a much-talked-of figure whom everybody wants to see and hear; a man whose name is enough to attract thousands and thousands of people who could not really be included in the category of music-lovers.

Mr. Cochran has told me so. The London manager of the Gramophone Company has told me so. And their judgment should be good enough for anyone. But, apparently, it isn't good enough for the B.B.C.

Only once in the whole history of broadcasting in this country has Chaliapine stood before the microphone, and that over two years ago, in 1925.

"Why is that?" I asked Chaliapine, when I talked with him the other day.

He smiled whimsically.

"There is a very simple reason, my friend," he replied. "Once here in your London I broadcast. It was two years ago, and I did it because they asked me to. I have not sung at Savoy Hill again just because I have not been asked again. To you, perhaps, it may sound incredible, but it is just the truth."

It *is* a simple reason, indeed, but one which raises an even more perplexing problem. Why have the B.B.C. not invited Chaliapine to broadcast again this year when his name has been on the lips of everyone in the country—when every newspaper has been full of his praises, and when he had been in London for quite a lengthy visit?

After Due Consideration

B.B.C. programmes, as we have been informed, ad nauseam, are compiled after the programmes' committee have duly taken into consideration the written demands of their correspondents. Are they really going to tell us that a good proportion of writers during the days following Chaliapine's broadcast in 1925 did not enthuse over his singing and ask for more? Would they have us believe that at least a hundred—perhaps a thousand—requests for another wireless broadcast by Chaliapine have not been received recently, following his tremendous success at the Albert Hall? Has it never struck them that there are a million listeners who would like to hear this famous vocalist on the radio better than any other concert or opera artiste in the world?

"Ah," Savoy Hill might object, "his fee would be too big. We daren't invite him because we know we shouldn't be able to afford to include him in our programmes."

Not Wanted?

I do not propose to deal with the question of how much the B.B.C. *can* afford without going into bankruptcy, and it does not arise as far as Chaliapine is concerned.

"But no," he said to me, "the question of fee would not be an insurmountable objection to my broadcasting, I am quite sure. I should not ask anything colossal. All I should ask would be a fair remuneration, based on the value of my services. I am always prepared to be reasonable and friendly. I want as many as possible of my British public to hear me sing, and I realise that they can't all come to my few concerts.

Chaliapine, the great Russian singer.

"But the reason I have not been asked to broadcast—perhaps that is something I can tell you without too much guessing. When I was first asked to sing in 1925, then the wireless people needed me. They needed my name and the name of every big musician and singer they could get in order to convince the people of this country that broadcast music was *real music*, and not just a 'stunt,' as you say.

"I helped them gladly, and many of my fellow artistes helped them, too. But now we are not needed to attract people to listen-in. We have served our purpose, and are no longer wanted.

"In those days broadcasting was being run by a private company, which depended for its existence upon the pleasure of the people. It had to give them what they wanted or else close down altogether. But now your broadcasting is a government monopoly, and who shall convince me that that corporation really care very much about what the people *want* to hear?

"If they had one, or perhaps two, other companies competing with them, should I have been asked to sing? Yes, and by all three. But that is not the way of monopolists.

"'Listen to what we give you,' they say. 'We know what is best for you to hear, and what is most convenient for us to give you. If you don't like it, then don't listen at all.' The B.B.C. is a government department now, and whoever heard of a government department who cared anything about music or art—or very much for the wishes of the people?

Poor Results.

"Some may think it is a little unkind of me to say that. But it is the truth as I see it. And I do not complain—ah, no! Perhaps I, and other artistes like me, can do something for the B.B.C., but what can they do for us?

"Can they enhance our reputations? Can they make us more popular? They can't, and I doubt if it is to the advantage of any established artiste to appear before the microphone at all. It may be that transmission as good as possible is made from Savoy Hill, but what of the sets upon which our voices are received at the other end? If I could hear my own singing through some of the loud speakers and headphones I know of, I might say: 'So that is Chaliapine! Is that the voice of which everyone is talking? I don't think so much of him; I shall not go to his concert.'

"For myself, I have nothing to say against broadcasting as broadcasting. It is one of the most wonderful and amazing things in this wonderful world. In the right hands it would do so much good both for music and music-lovers. One day it may. But as a government department, think you? Ah, my friend, no wonder so many people are dissatisfied with your broadcasting."

TECHNICAL NOTES

By Dr. J. H. T. ROBERTS, F.Inst.P.

DETECTOR METHODS

GRID LEAK OR ANODE—LOFTIN-WHITE COMPONENTS—CINEMA BROADCASTS—RADIO BEAMS.

WHICH is the best method of valve rectification? This is a question which has always been a favourite subject of discussion amongst experimenters.

There is no doubt that the most popular form at present is the grid-leak method of rectification, as this produces the loudest signals. The grid-leak method, however, suffers from the fact that it readily introduces distortion which, of course, is particularly undesirable for the reception of telephony.

Anode rectification (or lower-bend rectification, as it is sometimes called), gives better signals, although, as mentioned above, the strength of the signals is apt to be somewhat less than with grid-leak rectification.

Where high-frequency amplification is used it is probably better to use anode rectification, thus ensuring the better quality of the signals. Any loss in signal strength may then easily be made up by the little extra high-frequency amplification.

Grid Leak or Anode.

It is a comparatively simple matter to change over from the grid-leak rectification to the anode rectification. For simplicity we will suppose that the set is a single-valve set. The grid leak and condenser should be removed and the aerial end of the tuning coil connected direct to the grid of the valve. A potentiometer of, say, 300 ohms should be connected across the low-tension battery, and two extra terminals should be provided on the panel.

The earth terminal should be disconnected from the low-tension (positive or negative, whichever it may be), and one of the two extra terminals should be connected to earth. The other extra terminal should be connected to the potentiometer.

A grid-bias battery should then be connected to the two extra terminals, the positive of the grid-bias battery being connected to that terminal which goes to the slider of the potentiometer, and the negative terminal (wander plug) to the other terminal which, as mentioned above, goes to earth.

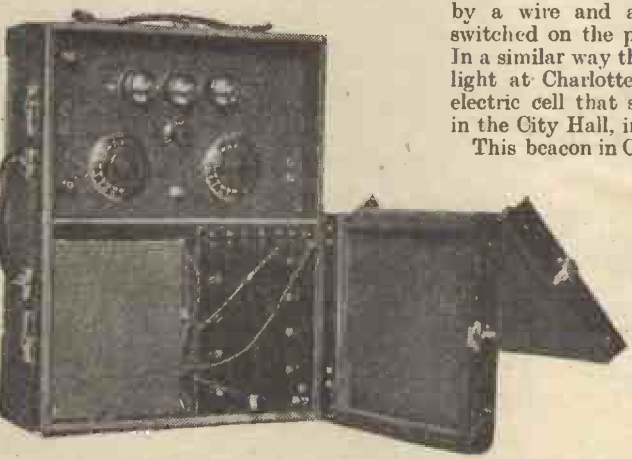
It will be necessary, of course, to try different tappings of the grid bias, or different maximum values of grid-bias battery, in order to obtain the best results.

Liquid Condenser.

I see the "mercury condenser" which I described in these Notes some time ago, and which appeared for a short time on the American market, is now advertised in the German radio journals. This condenser uses mercury as one electrode and into this dips a vane (or vanes) coated with a very thin layer of insulating material such as celluloid or shellac varnish. The mercury lies at the bottom of the containing cell, and as the vane is rotated it dips more and more into the mercury and so the capacity is increased. Owing to the fact that the mercury makes contact with the outer surface of the di-electric without friction, it is quite possible to use an extremely thin layer of di-electric, and consequently a mercury condenser of given electrostatic capacity may be made to occupy much less bulk than a condenser of the same capacity but of the conventional air-spaced type. The di-electric, in the German "quicksilver" condenser is only 3-100th of a millimeter in thickness. The condenser is very light in weight and the price (in Berlin) is 15 marks.

Loftin-White Components.

Those of you who made up and experimented with the Loftin-White circuit will be interested to know that in view of the great popularity of this circuit, especially in the United States, special Loftin-White components are now available in commercial form.



A popular portable German receiver, with two carrying straps and accessible controls.

A special set of three coils can be had, the aerial-coupling coil and two inter-stage coupling coils. The aerial-coupling coil comprises primary and secondary windings which are fixed in their coupling relation, mounted on a thin bakelite strip which also carries lug terminals for soldering. The windings themselves consist of silk-covered copper wire which is wound upon a "former" and then impregnated with a cellulose dope. The "former" is then removed and leaves a coil the efficiency of which is high, owing to the fact that a very small amount of di-electric material is used.

Accurate Adjustment.

The two high-frequency transformer units are wound in a similar way, but each is equipped with a mechanical device which permits variation of the coupling between the primary and secondary. This variation is controlled by hand and the coupling may be adjusted with extreme accuracy. In the Loftin-White receiver the coupling adjustments need be made once only. These transformers are made capable of accurate adjustment so that they may be simultaneously tuned by means of a tandem condenser. This means that for practical purposes their inductance values may be made accurately equal

The terminals are in the form of soldering lugs, as already mentioned, and these lugs are mounted upon the bakelite strips which also serve the purpose of supports for the coils themselves.

The three units thus furnish the complete coil equipment for the Loftin-White circuit, which includes two stages of tuned high-frequency amplification and a tuned detector-input circuit.

Photo-electric Relay.

How an almost infinitesimal amount of power may be used by means of a relay system to control an enormously greater power was lately demonstrated in an interesting test carried out in New York. By means of a photo-electric cell, a flashlight of one candle power caused the switching on of a great searchlight at Charlottesville, in Virginia, of nearly one-and-a-half-million candle power. When the flashlight beam fell upon the light-sensitive cell, an electric current was sent by a wire and actuated a relay, which switched on the power for the searchlight. In a similar way the first glow of the searchlight at Charlottesville operated a photo-electric cell that switched on a flood-light in the City Hall, in New York City.

This beacon in Charlottesville is intended as a guide for aeroplanes and is believed to be the largest searchlight ever constructed.

Cinema Broadcasts.

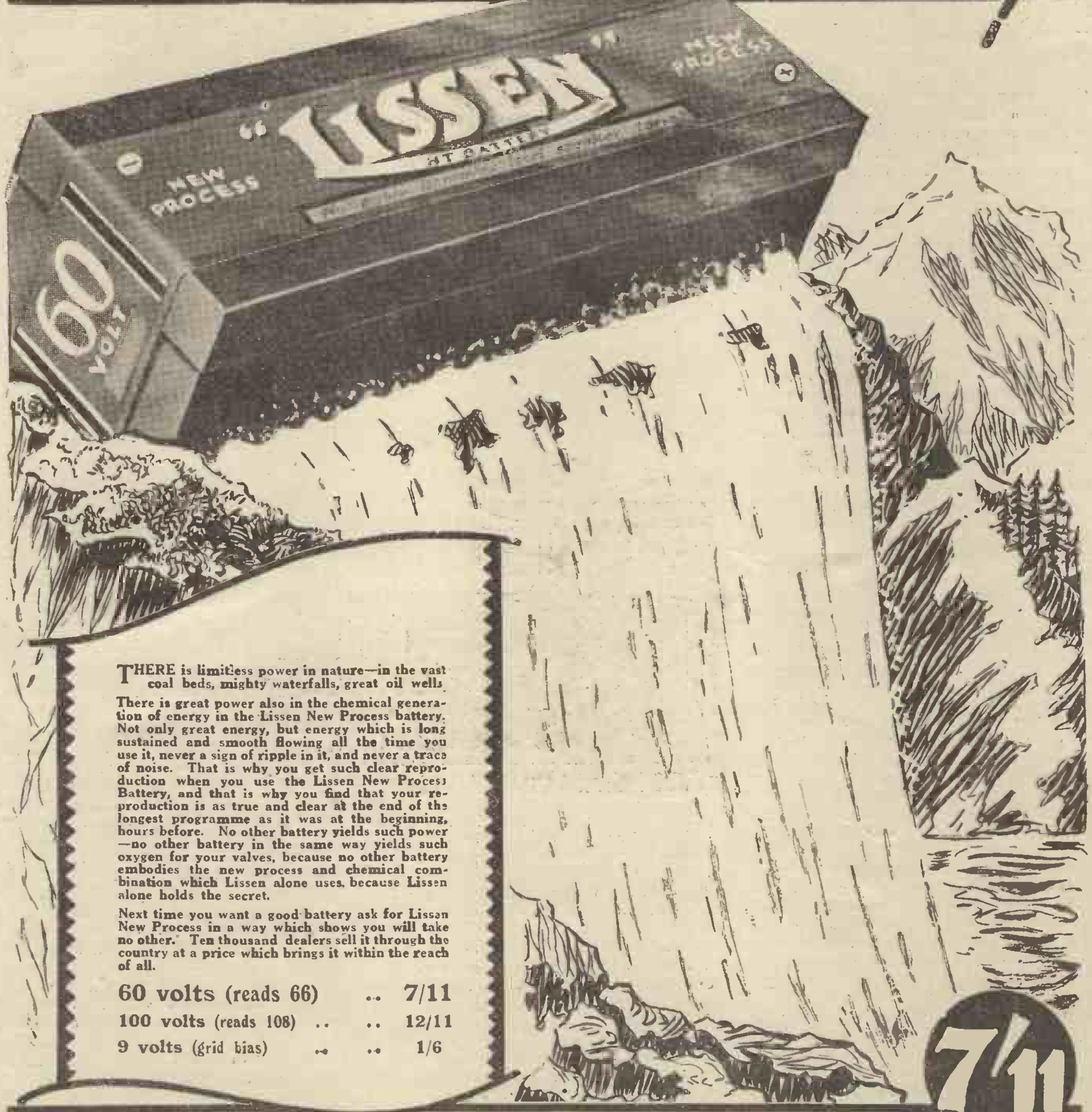
A method has been perfected in Germany for combining movies with radio for the purpose of illustrating broadcast lectures. In each theatre or other building where the broadcast lecture is to be heard, the films are run through a projector which is driven by a motor synchronised with the other motors in the system. The lecturer watches one of the cinema displays, or a private cinema display in his own studio, and times his remarks (which are being broadcast) in accordance with the progress of the film. The system amounts, in short, to the synchronising or simultaneous display of the same film in different theatres or halls and the broadcasting of the lecture or commentary to correspond.

Radio Beams.

Apropos the searchlight beacon for the guidance of aeroplanes as mentioned above, I see that the radio beacon system for use in aerial navigation has been progressing under the auspices of the U.S. Bureau of Standards, and the system now incorporates three main radio devices. The first of these is the directed radio beam, which sends out a special type of radio beam by which air pilots are able to follow their courses in fog

(*Continued on page 728.*)

THE SOURCE OF POWER!



THERE is limitless power in nature—in the vast coal beds, mighty waterfalls, great oil wells.

There is great power also in the chemical generation of energy in the Lissen New Process battery. Not only great energy, but energy which is long sustained and smooth flowing all the time you use it, never a sign of ripple in it, and never a trace of noise. That is why you get such clear reproduction when you use the Lissen New Process Battery, and that is why you find that your reproduction is as true and clear at the end of the longest programme as it was at the beginning, hours before. No other battery yields such power—no other battery in the same way yields such oxygen for your valves, because no other battery embodies the new process and chemical combination which Lissen alone uses, because Lissen alone holds the secret.

Next time you want a good battery ask for Lissen New Process in a way which shows you will take no other. Ten thousand dealers sell it through the country at a price which brings it within the reach of all.

60 volts (reads 66) ..	**7/11**
100 volts (reads 108)	**12/11**
9 volts (grid bias)	**1/6**

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L.516

BRITISH BROADCASTING.

No. 5.—SAVOY HILL AND THE PUBLIC.

By THE EDITOR.

THE B.B.C. professes to take endless pains to test and gauge public opinion on programmes. The general view is that Savoy Hill is making heavy weather out of a comparatively simple problem. But let us begin by examining the various processes employed by Savoy Hill.

First of all there are the letters from listeners—always numerous both in London and in the country stations. It is understood that as many as ten thousand letters a week are addressed to the B.B.C. on programme matters. It is not surprising that the B.B.C. attempts to make capital out of this tremendous volume of correspondence. For one thing, there is a gratifying preponderance of satisfaction and adulation. For another thing, there is such a diversity of view, such degrees of praise and blame for every item in the programmes, that there is at hand enough evidence for almost any case to be convincingly supported.

If talks are attacked, the B.B.C. can trot out correspondence statistics in defence. If symphony music is attacked, equally strong refutation is taken from the letter-bag. If religion is attacked, then the answer of the correspondents is literally annihilating.

The B.B.C. keeps on saying that religious broadcasts get more appreciative comments from listeners than does any other item in the programmes. This means that more people write in insistently about the religious services than about jazz, for instance.

Alternative Sunday Programmes?

And it is precisely on this ground of the alleged popularity of the Sunday services that we discover the danger and weakness of trusting too much to letters from listeners. Religious services have a specialist audience —no doubt considerable in extent, but also notoriously keen and coherent.

In other words, nearly everyone who likes the religious broadcasting is so keen about it that he or she is ready to write and say so. This does not mean, however, that the vast majority of listeners, while ready to tolerate and occasionally to enjoy religious broadcasting, do not wish to be provided with a suitable alternative to religious services. This principle of an alternative to religion the B.B.C. will not concede, in the belief that the denial is in accordance with public opinion. If correspondence can be invoked to justify such a policy, then correspondence is *not* an infallible guide.

If the B.B.C. fails to find justification in correspondence, they are apt to invoke the aid of the Press in support of any particular line of action. But it is notable that they almost always refer to the *lay* Press rather than to the *specialist* Press.

Now, the lay Press looks upon broadcasting chiefly as a potential menace, and quite secondarily as a source of useful news. The bulk of the comment in the lay Press is, in fact, vitiated by policy considerations or by some kind of control from the B.B.C. It is clear, therefore, that the B.B.C. cannot claim to be consulting public opinion effectively by a tendentious interpretation of lay Press comment on broadcasting.

I was extremely interested in following the progress of the experiment with professional critics undertaken last year by the B.B.C. In theory this has much to be said for it. The idea was to secure weekly reports from a group of representatives of the main classes of listeners. These were to be paid and were to listen regularly. The consensus of their reports was to be regarded as a fair appraisement of current public opinion. The plan was worked for a year.

Although for a time the B.B.C. pretended to regard it as a success, it abandoned this attitude in the face of repeated evidence of its failure. The professional critics listening regularly produced nothing upon which any programme policy could be built. The very fact that they were successfully balanced meant that their opinions and their judgments cancelled each other out. The experiment was reluctantly abandoned some months ago.

A "Spanspace" Three built by one of our Bristol readers. This set has proved very popular.

Parliament No Solution.

The third instrument for registering public opinion is the Wireless Organisations Advisory Committee, which, under the able guidance of Captain Ian Fraser, meets monthly at Savoy Hill. This committee nominally represents all the recognised societies of listeners and experimenters. Its pretention to be a "listeners' committee" in the sense that it reflects the average opinion of millions of listeners has been seriously challenged, and with a measure of justification.

The total active constituency composed by the paying members of the societies concerned would not be greater than fifty thousand, but the unexpected fact emerges that this committee has been of real value in keeping the B.B.C. on the right lines on at least some programme matters. It would not be an exaggeration to say that if this committee were strengthened by the addition of a few representatives of the technical wireless Press it would go a very long way to establish effective and continuous contact between the B.B.C. and listeners generally.

What, then, is the essence of the problem which has caused so much anxiety at Savoy Hill and so much speculation generally? Looked at from the representative angle, the only solution of the problem is Parliament itself.

The new constitution of the B.B.C. was designed so that the ultimate responsibility for the broadcasting service would reside in Parliament. In the representative sense the House of Commons is the nearest possible approach to the ideal listeners' committee. But, unfortunately, two factors intervene to prevent the House from playing this new rôle. The first is that there is no time. The second is that barely ten per cent of M.P.'s either care or know anything at all about broadcasting.

Unfulfilled Promises.

Therefore, Parliament offers no solution, nor can any solution be found from the representative angle. The combined membership of wireless and listeners' societies is negligible. Plebiscites are inconclusive. Their only uniformity is their failure to attract general interest or to inspire general confidence.

The fact is that the representative angle is the wrong one. The reason why the Wireless Organisations Advisory Committee is helpful is not because it represents societies, but because it is made up of a group of common-sense individuals ready to approach programme problems with a fresh outlook. The essence of the problem of gauging public opinion is the intelligent consultation of commonsense. The B.B.C. need seek no mysterious or elaborate machinery. The man-in-the-street is not hidden in an inexplorable labyrinth, nor is he too coy to resist all advances.

While I am on this subject of public opinion, I must add something on a strange development of B.B.C. activity. Were we all to form our opinions of broadcasting from what we read of the B.B.C. in its own newspapers and in the lay Press I venture to think that the voice of hostile criticism would never be raised. The B.B.C. propounds, outlines, and explains its programme policy in a most convincing and reassuring manner.

The basic principles advanced are invariably sound and usually agreeable. The contrast programmes from 5 G B, for instance, were admirably explained, and initiated with the customary torrent of adulation from the lay Press.

But those of us whose business it is to examine the actual results of B.B.C. policy find many a slip in performance. The superlative claims of policy announcements are not fulfilled. Either these claims should have been modified or the standard of performance improved.

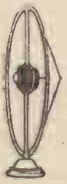
The B.B.C. would be well advised to guard against any increase of the gap between promise and performance. I am optimistic enough and confident enough of the ability of the B.B.C. to believe that the gap may be considerably reduced, not by restraining the exponents of policy, but rather by improving the standard of output.

Build your own Cone Loud Speaker

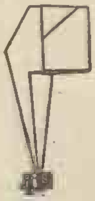
The LISSENOLA is the essential sound-reproducing base which you convert yourself into a loud speaker of whatever type you please. Used in accordance with the directions given with each instrument, the LISSENOLA yields results equal both in quality and in volume to loud speakers selling at several pounds. The secret of this remarkable efficiency lies in the effective manner in which the electro-magnetic sound reproducing system is concentrated.

Compare the price last. Make this test *before* buying: Go to your dealer—ask him to put on the best loud speaker he has in stock—then use the same horn on the LISSENOLA, *and see if you can notice any difference.*

A very successful type of speaker that can be made quite easily and cheaply from the directions given in almost any wireless journal is the Cone Diaphragm. Make the Diaphragm yourself—then fit the Lissen Reed to the LISSENOLA and clamp it to the centre of the cone by means of the two nuts provided. The purity of tone—and the volume — obtained will surprise and delight you. The illustration shows one method of mounting a cone diaphragm speaker.



But for biggest volume of all, build a big horn from the directions and full-size exact patterns given with every LISSENOLA. The illustration shows this effective horn, which can be covered with fancy paper and painted to resemble a factory article, and made by you for a few pence.



In addition, the LISSENOLA will fit the tone-arm of any gramophone, instantly converting it into a loud speaker.

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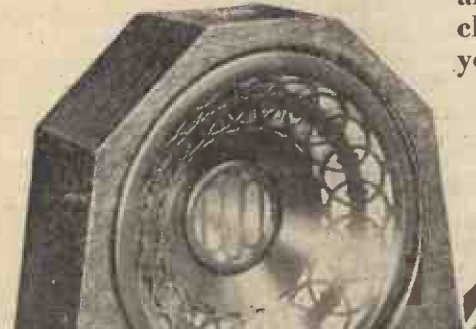

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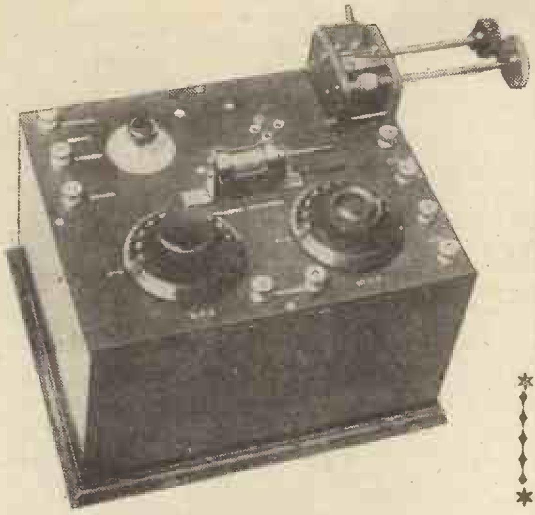


Are Reflex Circuits Fundamentally Unsound?

In this article some definite opinions on the subject are offered, and these are naturally very interesting in view of present-day knowledge.

By W. JAMES.

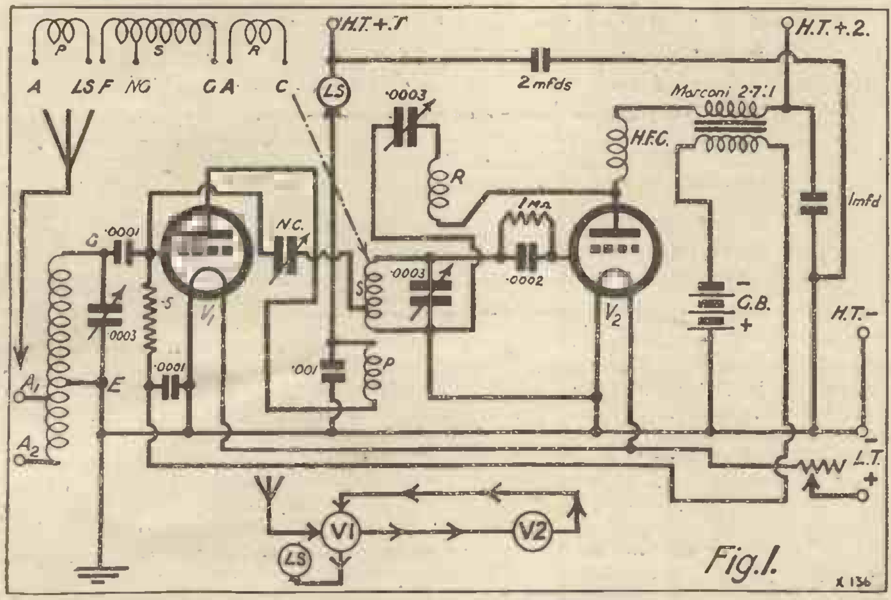


Fig. 1.

A FEW years ago many people used to say there was nothing quite so nice as a good reflex receiver, although one must admit that possibly an equally large number condemned them, saying they would not have one at any price. Of late very few reflex receivers have been described in the technical papers, and when they are described no great enthusiasm seems to be aroused, which surely is a pity, for to a few of the keener experimenters there is nothing like a good reflex set, considered purely from the point of view of economy.

Unreliable Sets.

It will, therefore, be interesting to consider for a moment whether all reflex circuits are fundamentally unsound. We may as well begin our inquiry by going back to the time when reflex circuits were first introduced to the public, when, in fact, reflex receivers were being pushed as the only sets worth having. Some of us knew at the time what many know to-day, that the majority of the reflex sets described were horrid, nasty things. Chronic instability, buzzing noises, and wretched quality were the main characteristics of such sets, which one regrets to say were described in numbers.

Readers of the papers concerned who made up a reflex set were, it would appear, soon divided into two camps. On the one hand were those who felt thoroughly satisfied; on the other, those who did not hesitate to condemn them. To the satisfied users I have nothing to say beyond this—in those days loud speakers were bad, power valves were expensive and bad quality was acceptable to many.

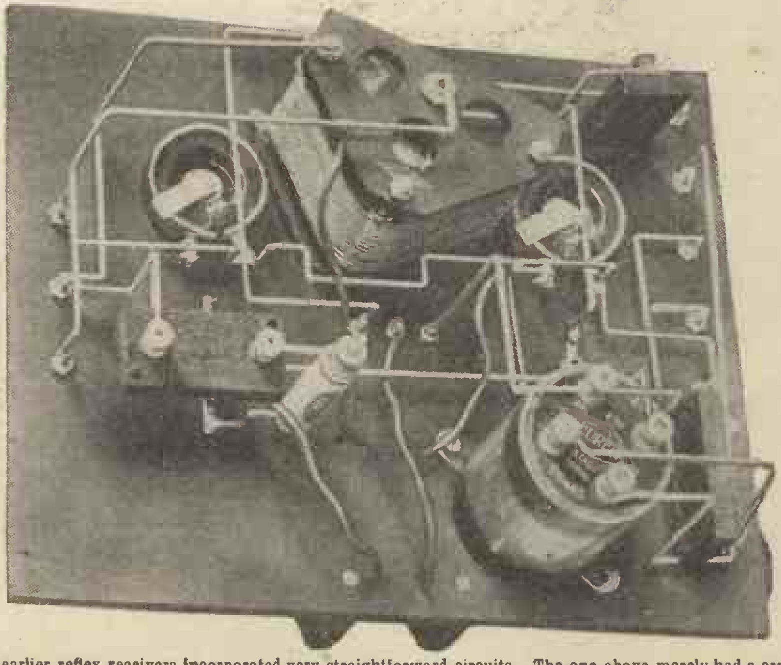
I am sorry for those who made up what turned out to be nothing but a faulty design, and who decided to turn their back on reflex sets for ever, for I believe that in so doing they have denied themselves a good deal of pleasure.

Two New Circuits.

A good reflex set is a most interesting affair, even if one can hardly claim for it in these days of reasonably priced valves the virtue of economy.

The point is this, that we have to admit that many of the reflex sets described in the papers some time ago, were very unsatis-

(Continued on next page.)



The earlier reflex receivers incorporated very straightforward circuits. The one above merely had a crystal detector and primary of an L.F. transformer connected across an anode-tuning coil. The secondary of the transformer was included in the grid circuit of the valve.

ARE REFLEX CIRCUITS FUNDAMENTALLY UNSOUND?

(*Continued from previous page.*)

factory and as compared with the few who constructed a reflex set and found it useful, many found themselves burdened with quite a useless contraption. It would, therefore, seem that he is a bold man who is prepared to put forward a reflex set and say that it will give good results, but I am prepared to do this, provided those who try the circuit stick to it and do as they are told in the matter of components, valves, and power supply.

Two circuits are given; that in Fig. 1 being of a two-valve receiver and Fig. 2 a three-valve. The three-valve set is merely the arrangement of Fig. 2 with a further low-frequency stage. Referring to Fig. 1 we see that the aerial can be connected to point A_1 or A_2, and that the secondary coil is tuned with a ·0003 mfd. condenser. The two taps give a choice of selectivity. This coil has a total of 75 turns of No. 22 D.S.C. wire, wound on a former 3 in. in diameter and 4 in. long; 65 of the turns are included between points G, and E, 5 between E and A_1 and 5 between A_1 and A_2.

Constructional Considerations.

In the anode circuit of the first valve, V_1, is the primary winding of the intervalve high-frequency transformer whose secondary is connected to the detector V_2. This is tuned with a ·0003 mfd. condenser, and it should be noted that a balancing condenser N.C. is joined between the grid of the first valve and a tapping on the secondary of the high-frequency transformer. The secondary winding of this transformer has 65 turns of No. 22 D.S.C. wire wound on a former 3 in. in diameter; the tappings should be made at the 10th turn. Over the turns 1 to 10, 8 or 10 pieces of ebonite or wood, ⅛-in. thick and ½-in. wide, are placed. These may be stuck on the surface of the covered wire, or held in position with a rubber band, while 8 turns of a fairly fine wire such as No. 30 D.S.C. are wound over the spacers, this winding being in the same direction to the secondary.

The method of connecting this coil in the circuit is shown in the diagram. One end of the secondary is connected to L.T.—, and the 10th turn from this end is connected to the balancing condenser, the top of the coil, of course, going to the tuning condenser and the grid condenser and leak. It is important to join the primary correctly, and the anode of V_1 should be connected to the bottom of the coil.

If this high-frequency transformer is too difficult to construct wind 65 turns of No. 22 D.S.C. on a 3-in. former, and then wind in the same direction a separate coil of 8 turns of the No. 22 D.S.C. The end of the secondary adjacent to the primary is then connected to L.T.—, while this end of the primary is connected to one side of the low-frequency transformer.

Reaction is obtained from the detector in the usual way, using a ·0003 mfd. variable condenser and a coil R. This coil is wound in the same direction as the grid coil, and has 15 turns of a fairly fine gauge of wire such as No. 30 D.S.C. It should be placed about ½ in. from the end of the grid coil.

To the anode of the detector is connected a Marconi 2.7–1 transformer, whose secondary is connected to the grid of V_1 through a ·5 megohm grid leak. Shunting it is a ·0001 mfd. condenser which tends to stabilise the circuit.

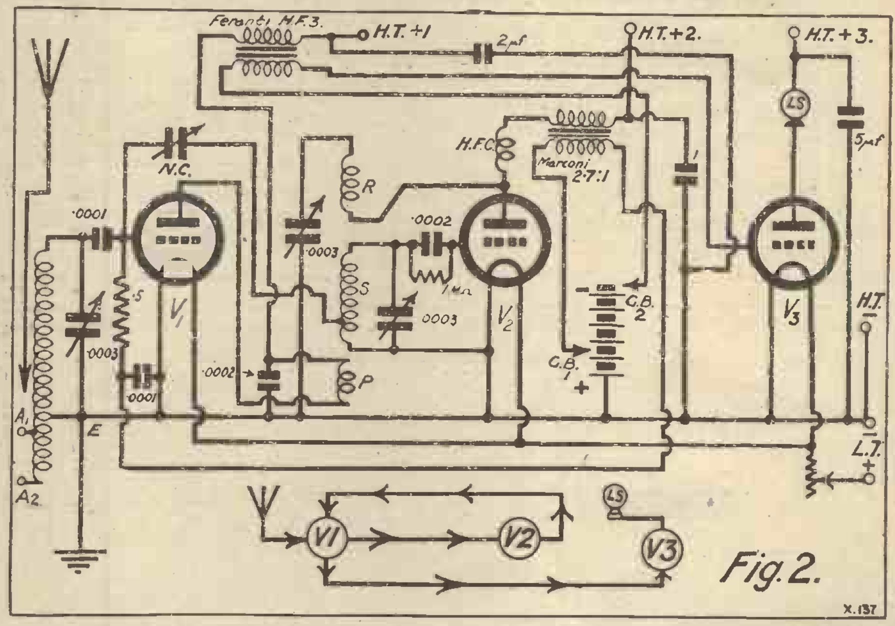


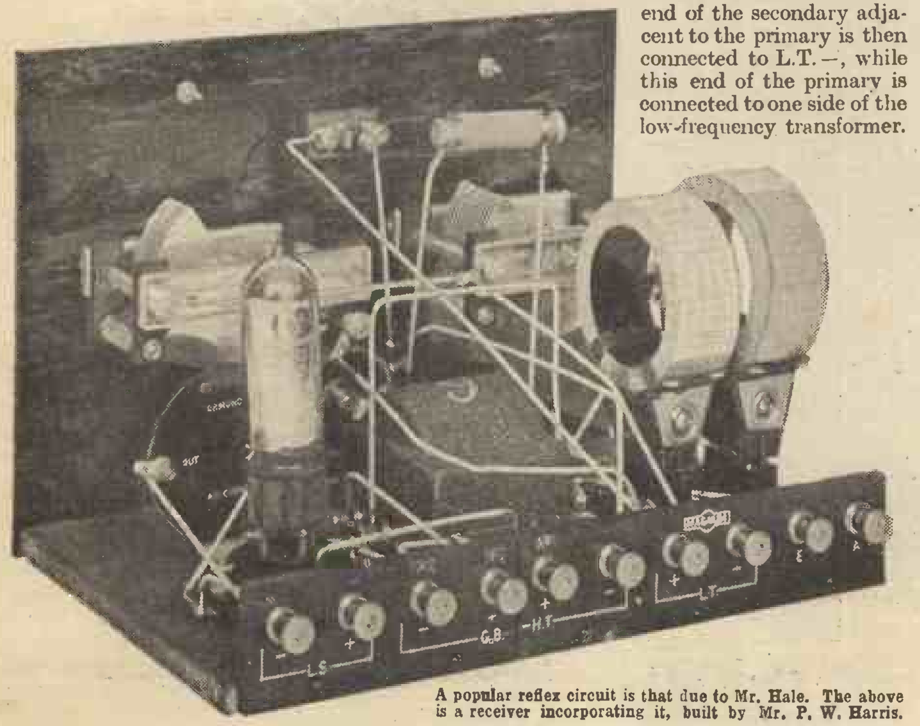
Fig. 2.

One of the most important things about reflex circuits is that valves having suitable characteristics must be used. For the detector in the Fig. 1 circuit, a valve having an amplification factor of about 20 may be employed, but the reflex valve must be of low A.C. resistance. A valve of 6–10,000 ohms will be satisfactory, and it *must* be used with ample anode voltage and grid bias. Preferably employ an anode battery of 120 volts with a grid bias of approximately —9 volts, depending on the valve, of course.

Good Quality.

The quality given by this receiver will be good, because care has been taken to preserve the higher and the lower notes, and it will be just as stable as other receivers having adjustable reaction. This receiver will not give quite the same results as a straight three-valve set, because we are sacrificing a small amount of high-frequency amplification by using a valve of the low impedance type at V_1, and also because of the method employed to feed the low-frequency currents to the first valve, but this two-valve receiver will give more volume than a straight two-valve set, and for an equal amount of reaction the quality will be quite as good.

There is no need to describe the three-valve set in detail, except to point out that the power valve used at V_3 should be a real power valve, and be supplied with ample anode voltage and grid bias. If this set is to be used at a place some distance from a broadcast station, valve V_1 can be of the type having an amplification factor of 15 to 20, but its A.C. resistance should not be more than about 20,000 ohms.



A popular reflex circuit is that due to Mr. Hale. The above is a receiver incorporating it, built by Mr. P. W. Harris.

Met-Vick Components make the most of a Set

WHETHER you are building the Met-Vick three or four Valve Sets or any other set, you cannot fail to get successful and satisfactory results if your components are Met-Vick. Most of the lines shown here are already well known amongst enthusiastic constructors and listeners; yet for those who have not yet used "Cosmos" Components, here are some details:—

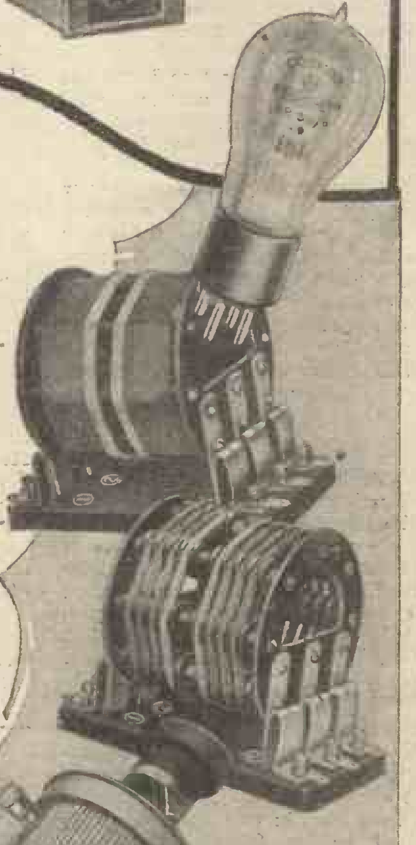
Met-Vick Battery Eliminators

A.N.P. (Astatic - Non - Parasitic) Coils.—These new "Met-Vick" products provide a clever solution of a difficult problem. They overcome, simply and efficiently, the three difficulties associated with H.F. amplification, namely: Magnetic coupling between coils, Stabilisation, and Parasitic Oscillation. List 4117/8.

Resistance Coupling Units.—"Cosmos" ("Met-Vick") Resistance Coupling Units are well known to all wireless enthusiasts. The "V" type can now be obtained fitted with new "Met-Vick" A.C. Valve Holder. The latter is also supplied separately. List 7117/8.

Valves.—"Cosmos" ("Met-Vick") SHORTPATH Valves for 2-v. and 6-v. battery working are available at the new reduced prices. The new "Cosmos" ("Met-Vick") A.C. Valves are also available. These make possible the operation of a set from the electric-light supply without any of the aggravating "mains noises." A special disc adaptor enables a "battery-set" to be easily converted without re-wiring. Lists 4117/3 and 7117/8.

Battery Eliminators.—"Met-Vick" Battery Eliminators are supplied in two models. The H.T.—G.B. Model can be used on various supply voltages of 40-100 periods. Grid Bias tappings are provided at 5, 10, 15, and 20 volts. A high voltage (up to 250 volts) can be applied to the last valve. The L.T. Model gives an output of 5 amperes at 4 volts without hum. List 7117/8.



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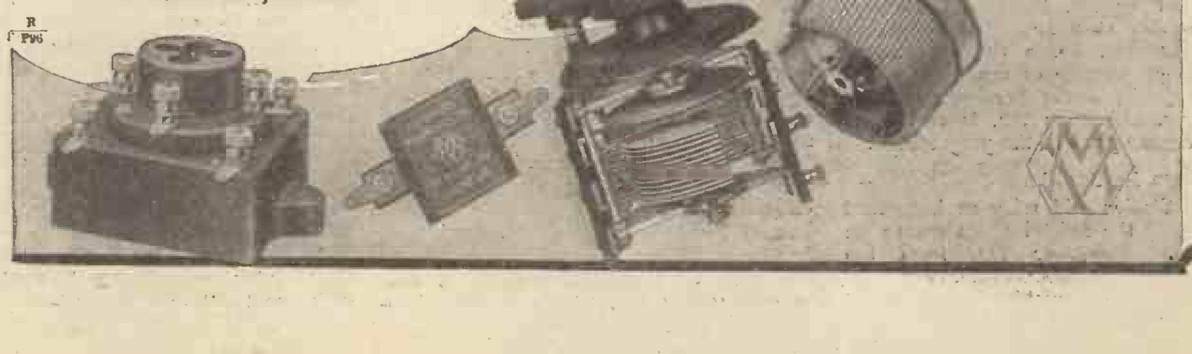


BROADCAST NOTES.

FROM OUR BROADCASTING CORRESPONDENTS.

Impromptu Concert at Manchester—Microphone Again in Danger—A Two-Piano Speciality—The Wireless Singers Again—Bristol Opera for Cardiff—The Growing Generation—Mr. Punch Disclosed—Sailors' Community Singing—Ireland's First Theatre Broadcast—Miss Bondfield to Broadcast.

Impromptu Concert at Manchester.

SOME time ago four of the most prominent musicians in Manchester met at the local studio, and over a cup of tea played or sang or talked, according to inclination. So successful was their programme that another is to be given in the same informal and impromptu manner to-morrow, Sunday, December 4th.

On that occasion five musicians will meet in the studio, namely Kathleen Moorhouse, a gifted young 'cellist, Leonard Hirsch, principal second violin in the Hallé Orchestra and a member of the Catterall String Quartet, Alec Whittaker, who at the age of twenty-two found himself the principal oboist in the Hallé Orchestra, and Elsie Boardman, contralto, who distinguished herself in the rôle of "Carmen" at the recent Manchester performance. There will also be piano solos by Eric Fogg, the station accompanist, who was last year married to Miss Moorhouse.

Microphone Again in Danger.

The last occasion on which the Glasgow Gaelic Musical Association gave a performance from the local studio the announcer had to stop some of the impromptu dancing which began when a piper struck up, as the vibration caused the microphone to suffer internal complications. The Association is giving another "Gaelic Evening" on Tuesday, December 6th, when the various items—part songs, mouth music for dancing and bagpipe selections—will be introduced by Mr. J. N. McConochie.

A Two-Piano Speciality.

Ethel Bartlett and Rae Robertson, two of the best-known two-piano artistes in London, are giving a short programme of their interesting and varied repertoire during the London programme on Tuesday, December 6th. In the same recital Sarah Fischer will sing some of the dainty folk songs of which she is so ideal an interpreter.

The Wireless Singers Again.

Since their formation some months ago the Wireless Singers, as a vocal combination, have become recognised as one of the most efficient and attractive organisations of their kind in this country. They are trained by Mr. Stanford Robinson, chorus master at 2 L O, and consist of eight performers, i.e. a double quartet. The little programme of madrigals which they are giving in the London studio on Wednesday, December 7th, is certain to find a welcome place in the programmes.

Bristol Opera for Cardiff.

Cardiff Station will relay an important broadcast of the Bristol opera season on Wednesday, December 7th, from the Victoria Rooms, Clifton, Bristol. The work chosen is "The Travelling Companion," by Charles Villiers Stanford, and the principals are Steuart Wilson, Arthur Cranmer, Johnson Douglas, Louise Trenton, Dorothy D'Orsay, Judy Skinner, and Leyland White.

The Growing Generation.

Those who can listen during the afternoons should not miss the last talk in the series on "The Growing Generation," which is to be given on Thursday, December 15th, by Mr. Alec Patterson, one of the Prison Commissioners. Mr. Patterson is mainly responsible for boys in Borstal Homes, and has just published a little pamphlet containing some biographies of these youths, under the title of "A Bad Start and a Good Finish." Recenty he made an effort to raise funds to build a chapel for the boys of Borstal, which it is proposed shall be dedicated to the memory of those who passed through the various Borstal establishments and made good in the war.

The new mechanised Army finds radio the most rapid and reliable means of communication between units.

Mr. Punch Disclosed.

The true history of Mr. Punch and his lamented wife Judy and the other members of their family form quite an attractive item in the programme from London and other stations on Friday, December 16th. The entertainment, which has been devised by Mr. W. S. Meadmore and Mr. L. de G. Sieveking and will be presented by them in co-operation, introduces an actual Punch and Judy performance by one of the oldest showmen at the game.

The average listener probably knows nothing of the history of this famous character, who was originally a hunchbacked Italian actor whose performances became so famous that the puppet-shows, for which Italy is famous, imitated and perpetuated him in the show which still makes the whole world laugh.

John Daniel: Gorilla.

The adventures of the famous gorilla, John Daniel, who for some time lived with his owner in aristocratic Sloane Street, and whose premature death soon after being taken across the Atlantic, forms one of the most interesting animal stories of recent times. Gorillas seldom survive long in captivity, and few people have had such opportunities of studying their ways in their native haunts as Dr. Neville Sharp, who recently returned from an expedition to Central Africa. Dr. Sharp is giving a talk on his observations of these animals on Saturday, December 17th, and it will be broadcast from most stations.

Sailors' Community Singing.

Community singing by an audience composed entirely of sailormen will be relayed from the John Cory Sailors' Rest at Cardiff and broadcast to Welsh listeners on Wednesday, December 14th. The concert is being arranged under the auspices of the British Sailors' Society by Mr. Oliver S. Hopkins, the Port Missionary, and the programme will also include items by Will Griffiths (entertainer) and the Madame Ben Davies' Ladies' Choir, which will lead the audience in popular old songs such as "The Old Folks at Home."

Ireland's First Theatre Broadcast.

The first theatre broadcast in Ireland takes place on Tuesday, December 13th, when at 8 p.m. listeners to Belfast and the Dublin stations will hear half an hour's entertainment relayed from the Empire Theatre, Belfast. The programme will consist of excerpts from "Hip, Hip, Hoo-Radio!" a stage revue adapted from the Radio Revue of the same name and presented entirely by broadcast artistes.

The principals are Grace Ivell and Vivian Worth, Kitty Murphy, Marian Wright, Dorothy Camlin, Richard Hayward, J. R. Mageean, Jack Chambers, Kenneth Coffey and Jack Gavin, all of whom, with the exception of Grace Ivell and Vivian Worth, "graduated" from 2 B E.

Miss Bondfield to Broadcast.

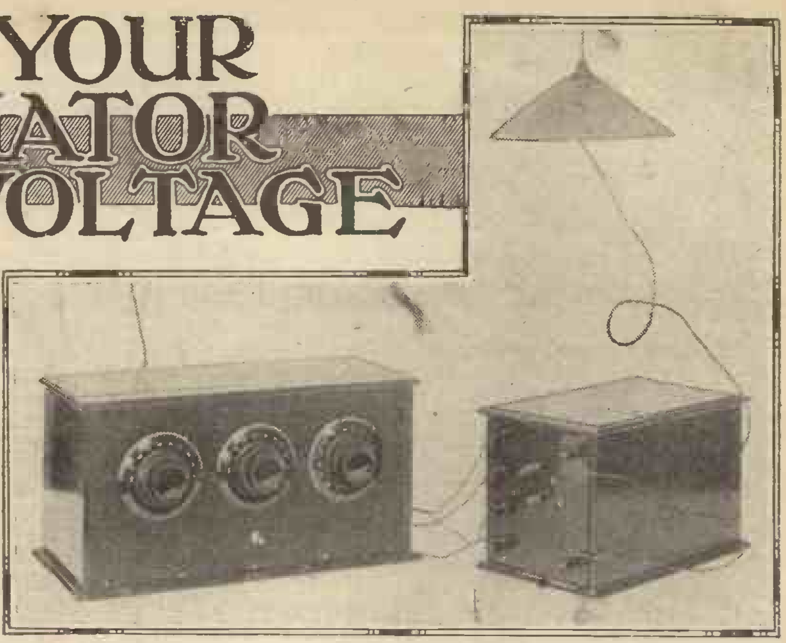
Miss Margaret Bondfield, M.P., who is probably the most distinguished woman member of the Labour Party, and who during Mr. Ramsay MacDonald's Government was Parliamentary Secretary to the Minister of Labour, is giving a talk in the London studio on Tuesday, December 13th, on the new Hostel which has just been opened at Market Harborough by the Overseas Settlement Department and the Commonwealth Government of Australia.

The Hostel is intended for the use of women who know little or nothing of household work, but who wish to settle in Australia and to whom the course at the Hostel is imperative before they are eligible for a free passage to "down under" under the Empire Settlement Act.

MEASURING YOUR ELIMINATOR VOLTAGE

An ordinary voltmeter is useless with a mains H.T. unit, but voltages can be determined in quite a simple manner if you know the way to go about it.

By G. P. KENDALL, B.Sc.



THERE can be little doubt that the set of the future will be operated entirely from the electric mains, both L.T. and H.T. being provided by suitable eliminator circuits, and batteries will remain merely for the use of those unlucky people who have no electric light laid on. The reasons for the inevitability of the change are mainly that batteries, with their charging, renewals, and variations of voltage, not to mention their noisiness at times, are found by most people to be a nuisance, and, further, that the modern tendency in loud-speaker work is all in the direction of larger and larger power valves and higher and higher anode voltages, and here batteries, even the largest, are of little use.

Measurement Difficulties.

The change, then, is one which must come sooner or later, and the wise man is undoubtedly he who is changing over now, and reaping the advantages of no-trouble operation, even if he does not yet feel justified in launching out into the latest thing in super-power amplifying circuits for working his loud speaker. The change-over, so far as the H T. supply is concerned, is really a very much simpler affair than most people imagine, especially with an A.C. supply, but there are one or two practical difficulties which must be overcome before the use of an eliminator becomes entirely satisfactory.

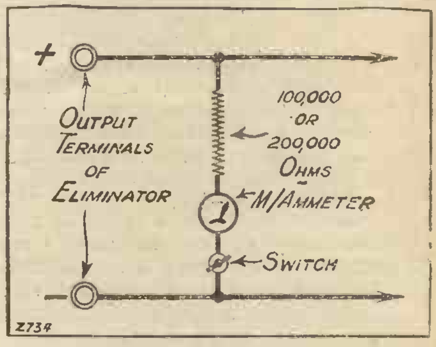
One of the most obstinate of these difficulties is that of measuring or estimating the actual H.T. voltages being applied to the various terminals of the set, and until it is overcome one is working in the dark in a very undesirable fashion.

The difficulty lies in the fact that the ordinary voltmeter is useless with an eliminator, for the reason that its resistance is low, and the current which it draws is large enough to produce extra voltage drops in the eliminator circuits which completely upset the working conditions and make the reading which is obtained quite valueless.

Voltmeters of a type capable of giving accurate indications can be obtained, of course, but their high cost puts them out of reach for ordinary purposes, and most people have to fall back on the crude method of estimating the voltage by calculating the voltage drop across the resistance used in the eliminator to reduce the pressure, using for the purpose a knowledge of the currents flowing, this being obtained by the use of a milliammeter. The process is always troublesome, and in some cases cannot be carried out at all because the values of the resistances in the eliminator are not known.

A Simple Solution.

It is far preferable to be able to read the voltage directly by means of an instrument, and a simple scheme for doing this has now been adopted in the "P.W." Research Department, which enables it to be done with the aid of a special resistance and a milliammeter of a type which need not be at all costly if a very high degree of accuracy is not required. There is no particular novelty in the method, which employs simple and well-known principles, but it does not appear to have occurred to anyone to apply it to the solution of this particular problem before, possibly because it was not realised that the necessary special resistance was ready to hand in the form of a cheap standard wireless component.



Briefly, the method is this: A high resistance of accurately known value is connected across the H.T. terminals, and in series with this is placed a milliammeter with a suitable scale to measure the current flowing. Then, by the simple application of Ohm's Law the voltage can be determined, the arithmetic involved being of a trifling nature if the value of the high resistance has been wisely chosen.

Simple Arithmetic.

An example will make this clear. Suppose that the resistance is of 100,000 ohms: a voltage of 100 across this will produce a current of 1 milliamp, 50 volts will give a current of ·5 milliamp, 40 volts one of ·4 milliamp, 25 volts one of ·25 milliamp, and so on. It will be noticed that there is a very simple relation between these figures; the figure for the current is exactly one-hundredth of that for the voltage. Obviously, then, all that we need do is to read the current flowing in milliamperes and multiply this by a hundred to get the H.T. voltage.

When this scheme is used the current drawn is quite small, as has been seen, and with many eliminators it will only produce quite a slight change in voltage when the

(Continued on next page.)

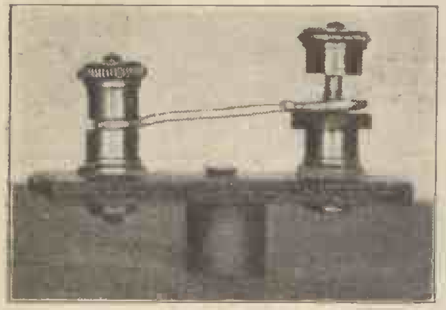
A reading being taken with a milliammeter and resistance, as described in the accompanying article.

SIMPLE SWITCHES.

An ingenious improvisation which can be carried out very cheaply and easily.

By HUMPHREY PURCELL.

THE types of switch on the market are legion. There are rotary switches, push-pull switches, throw-over switches, and switches that are combined with rheostats and tuning units and what not. Most of them are excellent, and even where a rubbing contact is provided, it is seldom that any trouble arises. They serve so simple a purpose that there could be no excuse for inefficiency, and for the same reason even the best of them functions no better than a simple home-made device.



Two terminals, a strip of fibre and a short piece of wire are the main items required.

Primitive Types.

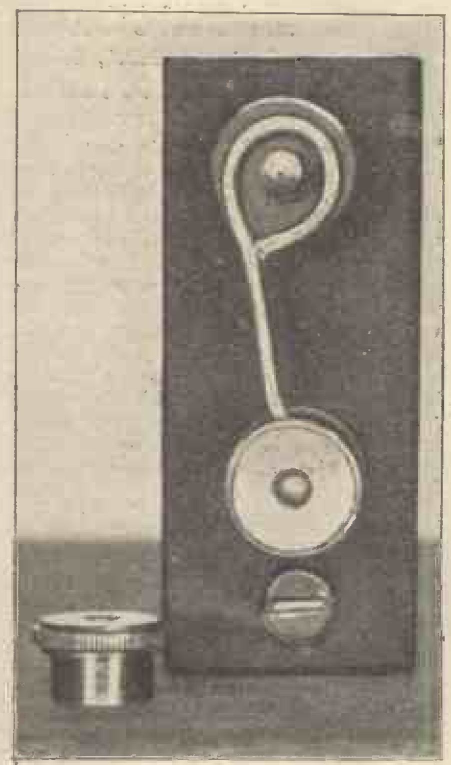
The simplest home-made switch is that which consists of two terminals and a piece of wire, the wire being inserted between the terminals for the ON position, and disconnected from one or both of the terminals for the OFF position. The wire may be stiff or flexible, and the terminals may be of the pillar type or the telephone type, mounted on the panel or above the baseboard, or they may be the terminals of large components such as variable condensers or resistances or L.F. transformers. If "Clix" terminals, or valve sockets, are used, the moving wire may be connected at will to any one of a number of points. There may be more than one connecting wire.

A Practical Scheme.

The only objection to these devices is that when the switch serves an ON-OFF purpose, either a spare disconnected terminal must be provided, or the connecting wire must be removed, or left hanging loose. The photographs herewith indicate a method of getting over this difficulty.

Two terminals of the pillar variety are mounted on the panel, or on a short strip of ebonite. These should have fairly large heads, and on one of them the portion of the threaded rod above the base should not be too short. On this terminal a small disc of fibre or thin ebonite is inserted just above the base. A piece of No. 16 tinned copper wire is then bent so that it is clamped securely in one terminal (pliers being used to tighten the head). This is the terminal which does not contain the fibre disc. On the other terminal the wire lies on top of the fibre in a loop which encircles but does not touch the central threaded rod.

It will be seen that when the head of the second terminal is loosened, the connecting wire touches the fibre disc but does not make contact with any part of the brasswork. The switch is thus in the OFF position. A turn or two of the head of the terminal will force it down on to the wire, and contact will be established. Connections are made to soldering tags on the other side of the panel or ebonite strip.



One terminal remains screwed tightly down, the other being used to provide the switching action.

MEASURING YOUR ELIMINATOR VOLTAGE.

(Continued from previous page.)

"voltmeter" is connected or disconnected. In the case of the tapping for the L.F. valves, for example, where the current flowing to the set will be fairly large, the effect of the extra current drawn by the "voltmeter", will be quite negligible.

There will be cases, however, where even this small current will be undesirable, and it is therefore recommended that it be cut down still further by the use of a higher resistance, 200,000 ohms being a convenient value. When this is used it will be necessary to multiply the milliammeter readings by 200 to get the H.T. voltage. If this proves troublesome, simply make yourself out a table like the one shown in the next column, and keep it handy for reference.

Milliammeter Reading.	Equivalent H.T. Voltage.
·1	20
·15	30
·2	40
·25	50
·3	60
·35	70
·4	80
·45	90
·5	100
·55	110
·6	120
·65	130
·7	140
·75	150

Type of Meter Required.

With this table at hand it is quite easy to read off intermediate voltages, assuming that the milliammeter has a sufficiently finely-divided scale.

This latter point brings us to the first of the practical details concerned, namely, the type of meter to use. What is wanted is an instrument with as large and open a scale as you consider yourself justified in affording, the scale to run from zero to one milliamp for preference.

Higher readings are unnecessary (the table will show you why), and to use a meter reading up to, say, 5 milliamps merely means that the scale will be very crowded and difficult to read. Evidently, then, it will pay to get a low reading meter specially for this work, but it need not be a very expensive one, since a very high standard of accuracy is not really required.

The special resistance can be dismissed very briefly: an ordinary anode resistance is used, several of the larger manufacturers being prepared to supply these to a certain definite standard of accuracy if this is specified when ordering. Messrs. R. I. and Varley, for example, will supply their standard wire-wound resistance to an accuracy of one per cent (or even nearer if desired), and this is quite close enough for all ordinary purposes.

An Exception.

A final point: In most cases you will find that the current drawn by this "voltmeter" is not large enough to have much effect on the H.T. voltage when the meter is put across the terminals, but an exception may be found in the case of a positive tapping supplying quite a small current, perhaps to a detector valve operating on the anode-bend principle.

So long as the currents involved are reasonably large, the device is quite sufficiently accurate, but this point should be borne in mind. Fortunately, however, it is not of great importance, since it is easy to adjust the voltage on a detector to the right value by audible indications without using a voltmeter at all. It is really in dealing with the H.F. and L.F. valves that the meter is so valuable.

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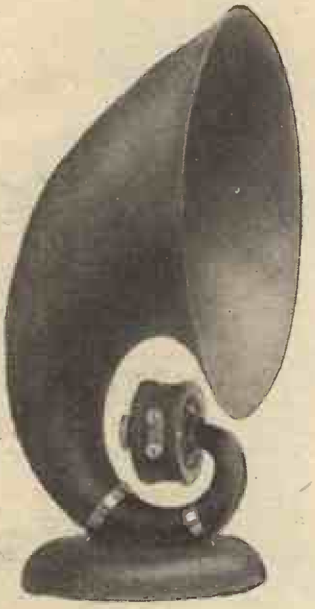

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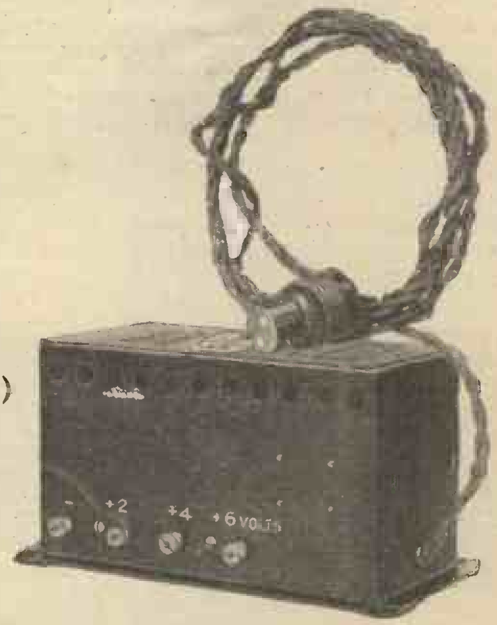

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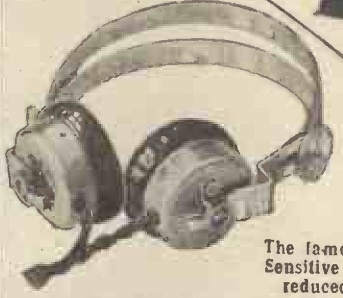

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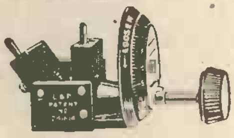

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CORRESPONDENCE.

RADIO IN NEW ZEALAND.

IMPERFECT R.C.— RECEPTION IN EGYPT.

Letters from readers discussing interesting and topical wireless events, or recording unusual experiences, are always welcomed; but it must be clearly understood that the publication of such does in no way indicate that we associate ourselves with the views expressed by our correspondents, and we cannot accept any responsibility for information given.—Editor.

RADIO IN NEW ZEALAND.

The Editor, POPULAR WIRELESS.

Dear Sir,—You may welcome a letter from a distant reader, having been here about nine months. I feel compelled to write these few lines on N.Z. radio.

On the 16th of July last, 2 Y A (Wellington) was officially opened, to the delight of the fans. It is working on 420 metres, with an aerial output of 5,000 watts, quite a change from 100 watts, which was the power of the old station, 2 Y K. Of course, the programmes are not of the standard that London and the Continentals put out.

I am at present using a five-valve receiver with much success, getting Australian stations on the loud speaker, the nearest being 2 B L and 2 F C (Sydney), a distance of 1,250 miles, and all the N.Z. stations—1 Y A (Auckland), 333 metres, 500 watts, 300 miles; 3 Y A (Christchurch), 306 metres, 500 watts, 200 miles; 4 Y A (Dunedin), 453 metres, 500 to 750 watts, 375 miles. A slight difference to picking up the Continentals with their thousands of watts. Fading is very bad here, and in town electrical interference is terrific, mostly caused by the overhead lighting system.

I have read with much interest your articles on Empire broadcasting, and my opinion is that some enterprising radio firm should have taken the matter up if it was only for the advertising they would have got, because since Philip's started this short-wave business their name has become a household word with the fans. I am at present working at a distributing agents for Philip's, and I guess by the quantity of valves, chargers and speakers that pass through our hands, for such a small population, they must well exceed the sales of any other manufacturer. British radio is poorly represented in the way of multi-valve sets, which seem very popular here, owing to the great distance of our neighbour, Australia. The majority of sets and components are Yankee, although the Brownie crystal sets are very popular just now. It is true there are some agents for British goods, but they give a very poor display. I don't like to be personal, but, taking (. . . .'s) agent as an example, they do not stock half the goods manufactured by (. . . .), and I am sorry to say it is inferior quality to that purchased in London; at least, the articles I purchased were.

It may interest you to know that a receiver licence is 30s. a year, and a dealer's licence is £7 or thereabouts; also, that howling sets are banned, dealers have to submit new sets to the Post and Telegraph Department for examination, but nevertheless there are some howlers.

Well, I think this is all the news for now, wishing your papers every success in the future.

Yours truly,
L. BEASLEY.

Wellington, New Zealand.

IMPERFECT R.C.

The Editor, POPULAR WIRELESS.

Dear Sir,—Since the controversy regarding the relative merits of resistance and transformer coupling is still continuing in your columns, perhaps I may be permitted to contribute a personal experience.

I went recently to see a friend who has just installed a "Kone" speaker, and who had made it perfectly clear to me that the detector and amplifier to operate it were to be as near perfection as possible. We had, in fact, worked out together a complete receiver to give straight-line amplification from 20 to well over 5,000 cycles, which was to end with a 1,200 ohm output (2 L.S.5a's in parallel), to ensure plenty of low notes.

As soon as I came in he asked me, "Well, how do you like it?" I listened for a moment, and then, without seeing the set, asked, "But why in thunder are you using a transformer?" "Chiefly," he replied, "to see if you could detect it without direct comparison with resistance coupling." And he then proceeded to remove the transformer and replace it, much to the relief of my ears, by a resistance.

The transformer he was using is made by one of the best-known wireless firms in the world, and is "guaranteed distortionless" by them; moreover, it was being used after a valve of the lowest impedance that was possible while still keeping short of the maximum safe primary current permitted by the makers.

The fact that the distortion introduced by the transformer was so completely unmistakable without any standard of comparison seems to me absolutely irrefutable proof that even the best transformer cannot approach the quality given by a properly-designed resistance amplifier. There are, however, two reasons why the opposite opinion is held by many people.

The first of these is that properly-designed resistance amplifiers are not common, while badly-designed ones are legion. One of the best-known and most widely-advertised commercial R.C.C. units, when used with the valves recommended, gives quality far inferior to that of a really good transformer, the cut-off on both high and low notes being very bad indeed. Obviously the makers have thrown away high notes with both hands in the endeavour to get high amplification per stage, and then, finding the tone "woolly," have deliberately cut low notes (by juggling with the grid condenser) to get the average pitch about right. The result is that only middle notes remain, so that music becomes a horrible travesty of its real self.

Most users of resistance amplifiers are as far from perfect quality as those who use transformers, so why wonder that so many still stick to the transformer, which offers fewer pitfalls to the unwary!

The other point is that unless the loud speaker is fairly good, small differences in quality due to changes in the amplifier are not apparent. It is pure waste of time to design an amplifier for a horn speaker; any collection of odd parts, moderately intelligently used, will give quality better than such a speaker can reproduce, so that improvements over this are simply not heard. Most of the diaphragm or cone type, even, cannot discriminate between the best possible transformer amplifier and a nearly perfect resistance amplifier. But this is no reason for keeping the transformers, but only for getting a better speaker.

Yours, etc.,
A. L. M. SOWERBY (M.Sc.).

London, W.2.

RECEPTION IN EGYPT.

The Editor, POPULAR WIRELESS.

Dear Sir,—In your issue of POPULAR WIRELESS for October 1st, you publish a letter from a Turkish reader resident in Constantinople, giving the results he had obtained using a five-valve set with three stages of high frequency.

I thought that you might perhaps be interested in a report concerning reception here at Aboukir. Using a four-valve receiver—1 high frequency, detector, and 2 low frequency—of which I only employ the first three valves on account of the second low-frequency stage so greatly amplifying atmospherics, I regularly receive the following stations:

	Strength.
Daventry (5 G B)	R.8.
Daventry (5 X X)	R.6.
Moscow	R.8.
Stamboul (our "local" station—distant 380 miles)	R.9.
Vienna	R.8.
Naples	R.7.
Paris (1760 metres)	R.6.
Rome	R.6.
Langenberg	R.4.
Koenigswusterhausen	R.5.
Berlin	R.5.

(All above on 'phones.)

There are dozens of other stations that I receive at irregular intervals. For instance, some time ago I tuned in an English (or Irish) station somewhere about 300 metres—a gentleman singing "Mother Machree," the enunciation was perfect—it was a night particularly free from atmospherics, I remember. It would be somewhere about the middle of September. Atmospherics are our bugbear out here. Some nights they are so bad that one can hear nothing, even from our "local" station, Stamboul. To-night I have just tuned-in to a very powerful station—and an utter stranger to me—whose wave-length, carefully measured, appears to be 1725 metres. The programme up till now has comprised nothing but speeches in a quite strange language, and apparently in a public hall, as the sound of applause can be heard. The strength—on three valves—is about R.8, so it must be a pretty powerful station. It is not Paris (1760), as not a word of French has been spoken.

Wishing you a very deserved success,

Yours very sincerely,
GEO. BRUCE OSWALD.

Royal Air Force Depôt, Aboukir,
Alexandria, Egypt.

"DETECTING DISTORTION."

The Editor, POPULAR WIRELESS.

Dear Sir,—In connection with Mr. W. James' article on Detecting Distortion in a recent number of POPULAR WIRELESS, perhaps the results of some aural tests which I recently carried out would be of interest to some of your readers, particularly as they seem to point the way to considerable economics of H.T. current.

In the end, it is the ear which has to be satisfied with the quality of reproduction, and while it is impossible accurately to judge the quality of ordinary music by ear, yet if a very nearly pure note can be applied to the loud speaker and its strength suddenly increased, any serious distortion of the loud note in comparison with the softer one is readily detected.

I have set up an audio-frequency generator which will produce, as I believe, a very nearly pure musical note of any frequency. Experimenting as outlined in the previous paragraph, the conclusion I come to is as follows: The smallest flow of grid current introduces clearly audible harmonics, whereas a considerable amount of bottom-bend rectification can be allowed without any noticeable change in the purity of the sound produced.

I am now using 36 volts grid bias on a D.E.5A valve with only 120 volts H.T., the anode current being about 8 milliamps or less, and I can get louder and purer signals than when I was using 20 volts bias (which is in itself greater, I believe, than is usually recommended for this valve) and twice as much anode current. On loud bass notes the anode current will increase by 2 or 3 milliamps but no detectable distortion results.

The power valve is preceded by a Ferranti A.F.3 transformer and followed by an output transformer of the same make, feeding a cone type Lissenola-driven speaker.

I should be interested to know whether any other of your readers get similar results by using high values of grid bias.

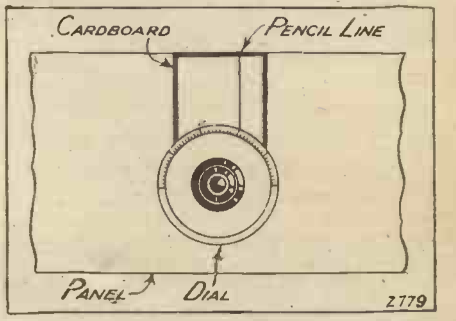
Yours faithfully,
A. K. G.

Blundellsands,
Lancashire.

A DIAL INDICATOR.

By M. B.

A SIMPLE dial indicator can be made from a piece of stiff, white paper. The paper is stuck on the panel so that it comes just above the dial edge (see below). A pencil line is drawn down the middle of this paper. It is found that the black line shows up very well against the white paper.



A BATTERY TIP.

ALWAYS place your accumulators on an old book or on a piece of wood. There is always a lot of loose acid knocking about at a charging station, and however carefully the cells are wiped there is a possibility that a very fine film of acid may be left. Sulphuric acid is extremely corrosive, and it does not take much of it to ruin an expensive carpet or damage the inside of a radio-set cabinet.

However, if the accumulator is always stood on something, preferably an old magazine, stray acid will not be able to cause damage.

H. T. ECONOMY.

HOW LONG SHOULD THE H.T. BATTERY LAST?

A PRACTICAL ARTICLE ON AN IMPORTANT SUBJECT.

By PERCY W. HARRIS, M.I.R.E.

WHEN should we discard dry high-tension batteries and why? What is the end of their useful life? Probably nine people out of ten use dry batteries for their high-tension supply, and anything that can be done for economy in this direction is well worth consideration.

Firstly, then, on the question of discarding the batteries. It is not merely the drop in voltage that causes us to discard batteries. One of the chief reasons is that a three or four-valve set operating from a common high-tension dry battery becomes unstable, tending to howl, and gives distorted reproduction after a time. We therefore conclude that as the signal strength has gone down at the same time, that a new battery is required, and on discarding the old one and putting a new one in place, we immediately get a return to our original volume and quality.

High Internal Resistance.

Now, as a battery gets older its internal resistance goes up and this causes a drop in voltage. We will assume that we have a battery which, when new, gives 120 volts. When this has dropped to 90 volts we get all the troubles above referred to. It is easy to prove that it is not merely the drop in voltage that is the trouble, for if we take off the old battery now giving 90 volts on load and substitute for it a new 90-volt high-tension battery, we shall find that, save, perhaps, for a reduction in volume and a little blasting on the very loud tones, the reproduction is almost as good as before, and certainly there is none of that distortion and tendency to howl which characterised the set with the old battery.

What, then, is the reason? Simply this, that the relatively high resistance of the battery, being common to each valve circuit, forms a coupling between these circuits and produces unwanted inter-action effects. In fact, many sets with high frequency are found to oscillate badly on an old battery, whereas, with a new one they are perfectly stable. This common battery coupling is a very frequent cause of trouble.

Causes Coupling Effects.

Let us imagine, then, that we have just discarded a 120-volt battery which has dropped to 90 volts and installed a new 120-volt in place of the old one. The results are, at the moment, good, and will remain reasonably good until the voltage drops to round about the figure at which the old one gave trouble. What are we going to do with our old batteries? "It's no use keeping them," you say!

Not at all! A few minutes consideration will show that not only can we make use of these batteries, but that we can cause them to effect economy in our general high-tension consumption.

Some experiments I performed a little while ago indicated quite clearly that if first-class quality is sought in every regard separate high-tension batteries for each valve are an advantage. The reason of course, is that if each valve has its own high-tension supply from a separate battery, there is no resistance common to all the valve circuits, so that no matter how high the resistance of the battery, so long as the current supply is available for it at the voltage we desire, it does not matter what its internal resistance may be.

Returning now to our set with the new high-tension battery, which is serving as a common battery to several valves. Quite likely one or more of the valves in your set is resistance-capacity coupled, taking, individually, very little in the way of plate current. The demand of these valves is so small that the drain on the battery is negligible. Take your old battery which now gives 90 volts and place in series with it any other old battery you may have which will give 20 or 30 volts more, and you will obtain a high-tension supply at 120 volts—with a very high internal resistance, it is true—but quite capable of giving you the current you require for the R.C. valve at 120 volts.

Two advantages will follow from this arrangement. Firstly, you will reduce the drain on the main battery by a small amount, and secondly, which is much more important, the R.C. valve will not have even the slightest battery coupling with the other valve or valves.

To Eliminate the Trouble.

Most experimenters have a number of old batteries on hand, and if in a set you are able to bring together your old batteries so that you get a separate high-tension supply for each valve, leaving the new battery to supply the output valve, you will get a distinct improvement in quality, and you will be able to run the new battery for considerably longer than would otherwise be the case.

To prove this, I recently ran a set continually for six weeks after a common high-tension battery had been discarded through the production of distortion from common battery coupling, using old high-tension batteries to give a separate supply. This completely removed the distortion, and I got a further run of life (1) out of a battery which would otherwise have been discarded, and (2) out of a battery which had already been discarded.

Another way in which you can economise in high-tension supply from your batteries is to be careful in choosing your valves. Many good modern low-frequency transformers work better with what is generally termed a "high-frequency" valve (having an impedance of 15,000 to 25,000 ohms) than with a general-purpose for the detector valve, having an impedance of 7,000 or 8,000 ohms. The high-frequency valve, in such circumstances, will take less current from your high-tension battery as well as giving better results in reproduction and volume.

The difference, however, is not so great as might at first be imagined, for it might be thought, for example, that a valve of 21,000-ohm impedance would take only a third of the current of one of, say, 7,000 ohms when used as a detector valve. When it is remembered that invariably a positive bias is placed on the grid of the detector valve and that it is not worked at zero potential, it will be realised that there is not so big a difference as might otherwise be thought. However, the difference is worth while if you are trying to obtain economy in high-tension current.

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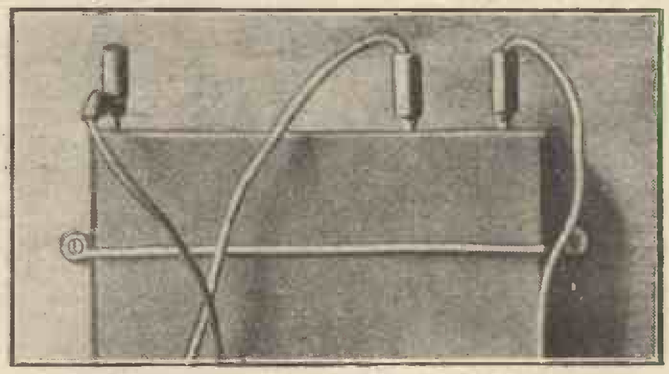
Use Large Batteries.

The biggest economy of all, of course, is making sure that one uses an adequate size of high-tension battery for the set to which it is connected. A set that has three or four valves is very extravagant to run on the small size of high-tension batteries. The larger sizes are more expensive as to first cost, but much cheaper in their "cost per hour." Obviously, one should calculate one's high-tension expenditure according to the period of time over which the battery is used. A ten-shilling battery which lasts, say, nine months is much cheaper than a five-shilling battery which would only last three.

This point, however, has been stressed on many occasions, and I do not think the same number of experimenters have realised the really useful economy named at the beginning of this article—the use of old high-tension batteries in series and as separate supplies for each individual valve.



The grid-bias battery plays a large part in the cutting down of plate current, besides making for pure reproduction.

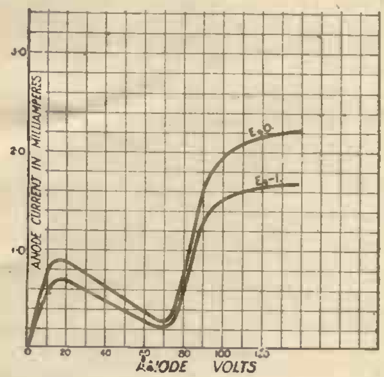
MARCONI SHIELDED VALVE Type S·625

The principal feature of the Marconi Shielded Valve Type S.625 is its elimination of all capacity effects between grid and plate. It thus opens up a new era in high-frequency amplification.

In practice, this valve gives an amplification of 30 to 50 per stage with absolute efficiency and complete stability over a wide band of wave-lengths.

The second grid of type S.625 overcomes the capacity effects between grid and plate, thus preventing the 'feed back' of energy which causes oscillation in an ordinary valve.

Moreover, the arrangement of the electrodes and leads makes it possible to use very simple and effective circuits. Approximately 120 volts of high tension may be applied to the anode and, owing to the great magnification and consequent large high frequency input to the detector valve, anode bend rectification may be used.



APPROXIMATE DATA—Filament Volts 6.0 max. Filament Current 0.25 max. Anode volts 120 max. Magnification factor and impedence values vary, but under typical conditions, are as follows ;

Screening grid volts	80
Grid Volts	0
Magnification factor	110
Impedence	175,000 ohms.

Price 22/6

Getting at the root of it

To get rid of the thistles in the delphiniums you don't cut them back with a pair of nail scissors—you grub them out by the roots.

To eliminate grid-anode reaction effects from high-frequency amplification circuits, it's no good fiddling about with neutralisation condensers.

Go to the root of the matter. *Neutralise inside the valve.* Use the Marconi Shielded Valve Type S.625.

Like every other Marconi Valve, the S.625 knows its job *and does it*—just because it was *designed and made* for it.

A Marconi Valve always is *designed and made*—it never just happens. Try Marconi and see—or rather, LISTEN.

A full description of Marconi Valves, Marconi Sets, etc., is to be found in an amusing but informative free booklet called "Back Chat" just published. To secure your copy send off the coupon below at once.

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—do everything that a valve should do

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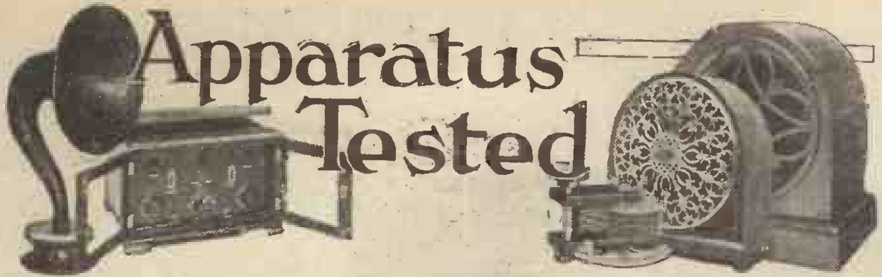


Apparatus Tested

Traders and manufacturers are invited to submit wireless sets and components to the "P.W." Technical Department for test. All tests are carried out with strict impartiality in the "P.W." test-room, under the supervision of the Technical Editor, and the general reader is asked to note that this weekly article is also intended to provide a reliable and unbiased guide as to what to buy and what to avoid.—EDITOR.

A NOVEL COIL-HOLDER.

ALTHOUGH there are rumours to the effect that there are to be considerable wave-length changes, it would appear to be definite that 5 X X (Daventry) is to carry on, more or less indefinitely, at 1,600 metres. In some respects this is good news, but from the point of view of set design it means that in the future we are still to be faced with the problem of switching from the high to low range. As a means of doing this the London & Provincial Radio Company, Ltd., have produced a novel version of their scaled reaction two-way coil holder. The moving and fixed portions of this each carry two complete coil sockets. These are arranged at such angles that two pairs of coils can be accommodated.

By means of simple switching either pair can be brought in or out circuit as desired. This ingenious coil holder will take practically any size of coil and, owing to a careful design, is not bulky or awkward in appearance even when it has the coils fixed in position. The advantages of having the separate coils both for aerial and reaction are, of course, obvious, and they are efficiently disposed of in this L. & P. Coil Holder. As we have already indicated, the holder incorporates the scaled movement and this enables calibration to be carried out.

The geared movement is quite a good one and the component seems to be a sound mechanical job. The price of this L. & P. "High-Low" is 14s. 6d.

Another new component due to the L. & P. people is the Variohm. This is a baseboard-mounting filament rheostat. It is not unlike an edgewise-mounted fixed condenser in appearance. The adjustment is carried out by means of a small bead which runs up and down a slit in the top. Along this aperture is moulded a scale which enables definite resistance settings to be obtained.

The adjustment is smooth and we note that an "off" position is provided. The resistance range of the Variohm, which we have had under test, is stated to be 0 to 10 ohms, and we found that this was a very close approximation of the component's actual characteristic. The Variohm is a neat, well-designed and well-made little component and retails at 4s.

NEW "COSMOS" COMPONENTS.

Some very interesting new components recently arrived from Metro-Vick Supplies. Included in these were a number of the A.C. valves. These Cosmos A.C. valves operate directly from A.C. mains. They have indirectly heated cathodes. The "raw" A.C. is taken to a heater which transmits its heat to a small metal tube coated with a mixture of oxides of two comparatively rare metals and from this the electrons are emitted. A particular feature of the Cosmos A.C. valves is that they can easily be adapted to operate in any existing sets without wiring alterations.

For this purpose special five-pin cap adaptors are available and these are of quite a simple nature and comparatively inexpensive. The type A.C. Green Spot has the following characteristics: Heater voltage, 4; Heater current, 1 amp.; amplification factor, 35; anode impedance at 120 volts H.T., 17,500 ohms, mutual conductance at 120 volts H.T., 2 milliamps per volt. The price is 22s. 6d. The very high amplification at a moderate impedance,

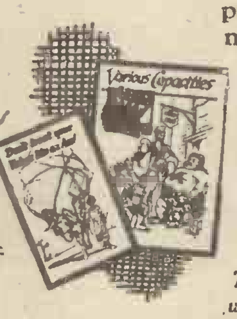
(*Continued on page* 716.)

Don't treat your Valves like an Ass!

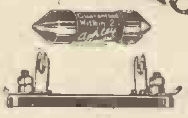
If your dealer cannot supply we send post free.

THE overburdening of Valves is so common, that the Ashley Resistor method of prevention when adopted, not only takes the extra load from the battery but relieves the burden of anxiety on the minds of those who may have to foot the bill for replacements.

And similarly, each of the other Ashley components perform their various functions reliably in the Home Set, so that nothing will go amiss in the absence of the person whose pet it may happen to be.

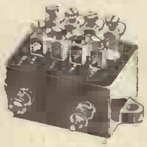


Two fully descriptive leaflets will be sent on request.



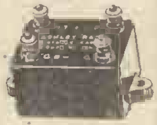
RESISTOR AND BASE 2/6

State particulars of valve for which Resistor is required when ordering.



MULTIPLE FIXED CONDENSER 5/6

15 various capacities from the one unit.



R.C.C. UNIT 5/6

Ashley Radio

Neatest and most reliable at lowest price obtainable.

GUARANTEED COMPONENTS

ASHLEY WIRELESS TELEPHONE Co. (1925) Ltd.
Finch Place, London Road, LIVERPOOL

Get better performance for a LONGER PERIOD

THE wonderful filament of specially treated nickel possesses certain properties (essential to the perfect functioning of a valve) possessed by no other metal. That is why, when these valves are used, broadcast programmes become uncannily real, and are endowed with an atmosphere which has hitherto been lacking. This re-creation of the transmissions is yours simply by changing over to these modern valves. It is surely good to get these results. It is still better to know you can keep them. You can, too—for a considerably longer period than with any other valve.

No doubt exists as to the superiority of B.T.H. Nickel Filament Valves, but we ask you to satisfy yourself by trying them in your set. Your ear will do the rest.

B 210 H	B 210 L	B 215 P
R.C. and H.F.	*General Purpose.*	*Power Amplifying*
Fil. Volts 2	Fil. Volts 2	Fil. Volts 2
Fil. Amps. 0.10	Fil. Amps. 0.10	Fil. Amps. 0.15
Max H.T. Volts 150	Max H.T. Volts 120	Max H.T. Volts 120
10s. 6d.	**10s. 6d.**	**12s. 6d.**

The above prices are applicable in Great Britain and Northern Ireland only.

Your dealer holds adequate stocks of these valves.

B T-H

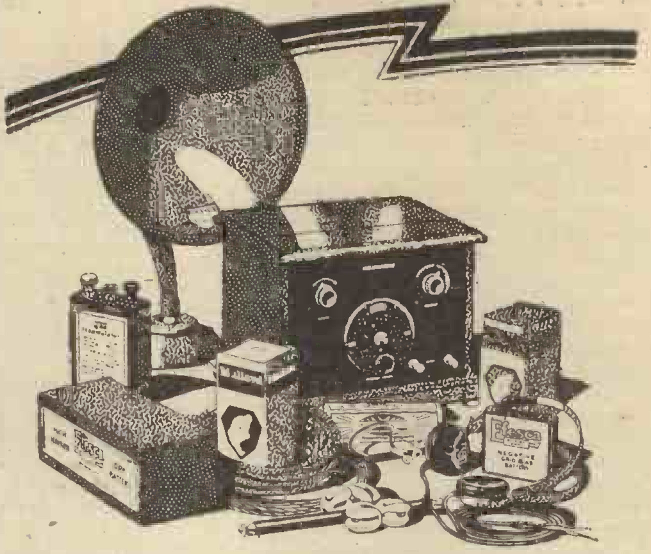
VALVES

NICKEL FILAMENT

Made at Rugby in the Mazda Lamp Works

The British Thomson-Houston Co. Ltd. 2872A

EFESCAPHONE SETS



The simplicity of the Efescaphone One Dial Receiver and its extraordinary results make it an Ideal Set for the man who is interested in Wireless as an entertainment rather than a hobby. Its ease of tuning by a single slow motion dial renders it suitable for quite non-technical users, while at the same time it is capable in practised hands of performance equal to much more complicated sets. In order to bring the Set within the reach of all we have inaugurated a Hire Purchase System whereby payment may be spread over 12 months. The equipment is supplied complete and the best material only is employed. Standard British Valves form part of the equipment.

Typical Sets

complete with Batteries, Battery Cable, Phones, Aerial Equipment, P.M. Valves and Puravox Loud Speaker, including Royalties.

CROMWELL	WOLFE
2 Valve £13 - 0 - 0 Cash	3 Valve £15 - 13 - 6 Cash
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Applicable only in Great Britain.

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GLASGOW, MANCHESTER, BIRMINGHAM, DUBLIN
NEWCASTLE and CARDIFF

APPARATUS TESTED.

(*Continued from page 714.*)

giving the extremely favourable mutual conductance figure, is a special feature of these A.C. valves, and one which gives them definite advantages.

The Green Spot is an all-purpose valve, and makes an excellent high-frequency amplifier, detector or first low-frequency magnifier. It gives very good results in any one of these positions. In comparison with ordinary valves we can almost say that it gives abnormally good results. Considerable amplification with freedom from microphonic noises and perfect stability is possible. The A.C. Red Spot is a power valve. The characteristics of this type are as follows: heater voltage, 4; heater current, 1 amp.; amplification factor, 10: anode impedance at 120 volts H.T., 3,000 ohms: and at 180 volts H.T., 2,500 ohms: mutual conductance at 120 volts H.T., 3·5 milliamps per volt, and at 180 volts H.T., 4 milliamps per volt. The price of this is also 22s. 6d.

Here we have a tremendous "slope." and one that in the usual way is not approachable. Needless to say this is a very great advantage, particularly for a valve of the power type, and considerable magnification can be obtained while a very excellent degree of grid swing can be handled. The makers claim that this valve requires only half the input to give the same output as the best battery-operated valve, and our tests would seem to indicate that their claim is by no means exaggerated.

In fact, we were considerably impressed by the operation of both of these Cosmos Shortpath A.C. valves. They conclusively prove that there is nothing to be lost and everything to be gained by changing over from batteries to the mains.

A short-wave set designed to the special order of the Sudan Government by the R.I. and Varley Co., Ltd. Its purpose is to receive radio time signals for checking chronometers.

In regard to the H.T. supply, the Metro Vick people supply an excellent full-wave rectifier, the S.P. 42/U. Operated at 4 volts and taking two amperes, this valve enables a D.C. output to be obtained of 50 milliamperes, which is quite sufficient for any but a very elaborate outfit, and it will stand up to 250 volts R.M.S. per anode. The price of the S.P. 42/U is 22s. 6d.

We have had a receiver in operation using these Cosmos valves throughout and deriving both its L.T. and H.T. from the mains, and its performance was well above the average in respect of both sensitivity and purity of reproduction. The Metro-Vick people supply all the necessary transformers, etc., at very reasonable prices. There is a complete L.T. battery eliminator for these A.C. valves at £2 10s. The output is 5 amperes at 4 volts. As the makers say: "This unit may be regarded as a substitute for the accumulator as used with the ordinary type of valve." The instrument is contained in a neat case with a crystalline finish, and is fitted with ten feet of flexible cable and an adaptor for plugging into a lamp holder. There are two types available one for 100 to 110 volt mains and the other for 200 to 240 volts. Either will operate at any periodicity from 40 to 100. This unit, as with all the Metro-Vick mains supply apparatus is designed in such a way that it can be safely operated by inexpert listeners.

Patent No. 269,388
PRICE
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COMPLETE WITH TERMINALS AND TAGS

Why the Redfern
Pneumatic Valve Holder
supersedes all other designs

(1). It positively absorbs all shock and vibration.
(2). Designed to dispense with spring suspension, it is entirely free from any natural vibratory frequency.
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REDFERN'S RUBBER WORKS LIMITED,
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Will you gag the Christmas Programmes?

Christmas Eve!—everything overhauled—batteries re-charged—lovely new (expensive) loud speaker that can also be used as a pipe rack—"NOW WE'RE READY . . . . . ready . . . . . ready . . . . .

* * *

"I think we'd better play 'Hunt the Slipper,' Aunt, as you suggested, I'm afraid the atmospherics . . . . . ." (and he can't even hear the atmospherics).

* * *

Not a bad set on the whole, but what are a couple of headphones amongst so many (fifteen all told and the twins) now that speaker has again become a pipe rack.

ETHOVOX

The happiest homes this Christmas (from the wireless point of view) will be the ETHOVOX homes—where the loud speaker looks like and speaks like a loud speaker.

* * *

And a round £3 will buy it—"this speaker that first made wireless popular." Go to your dealer NOW or come to our SHOWROOMS—15, BEDFORD STREET, STRAND, for a demonstration.

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Save shillings on every valve.

Compare our prices with those of other well-known valves and see what you save. Metal Valves are used in many Broadcasting stations *exclusively*, which is proof of their superiority, for Radio Station Engineers know from experience which valves are best.

Unlike some valves which only function efficiently when used on certain circuits, Metal Valves are designed to suit *all* circuits, and will get the best out of your set. Try

MÉTAL RADIO VALVES

Dull Emitter, Type C.L. 124, Loud Speaker Power Amplifier, L.T. 4 volts, 0·12 amp., H.T. 40 to 100 volts. .. .. Price 8/6

Dull Emitter, Power Amplifier, Type C.L. 162, L.T. 2 volts, 0·16 amp., H.T. 40 to 80 volts. .. .. Price 8/6

Dull Emitter, Type C.L. 202, H.F., Detector and L.F., L.T. 2 volts, 0·2 amp., H.T. 20 to 100 volts. .. .. Price 4/9

Dull Emitter, Type 6/100, H.F., Detector and L.F., L.T. 4 volts, 0·06 amp., H.T. 20 to 80 volts. .. .. .. Price 6/-

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OTHER TYPES IN LIST.

If unable to obtain from your local dealer, send direct, with remittance, stating type of valve required.

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RADIOTORIAL

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The constructional articles which appear from time to time in this journal are the outcome of research and experimental work, carried out with a view to improving the technique of wireless receivers. As much of the information given in the columns of this paper concerns the most recent developments in the radio world, some of the arrangements and specialities described may be the subject of Letters Patent, and the amateur and the trader would be well advised to obtain permission of the patentees to use the patents before doing so.

QUESTIONS AND ANSWERS.

BISCUIT TIN FOR SCREEN?

J. W. E. H. (Nr. Belfast).—"I intend to build a set employing the circuit of the "Cube-Screen" Three, given in "P.W." No. 280, page 329, but using a cabinet large enough to give plenty of room for modifications of lay-out. In connection with this circuit, could a small biscuit tin be used instead of a cube screen?"

No. The magnetic properties of an ordinary biscuit tin would be quite fatal to its effective use as a screen in any circuit of this type.

HOLES IN ACCUMULATOR CAPS.

"Dunno" (Redditch).—"What is the purpose of the holes in the little caps that fit into the tops of accumulators? Does it matter if they get stopped up?"

An active accumulator discharges a good deal of gas, especially when it is being charged, and the holes are there to allow this to escape. They should certainly be kept open, for the pressure of gas in a cell is sometimes quite considerable, and might be sufficient to cause the cell to burst if no outlet is provided for it.

SPARK WHEN CONNECTING UP THE H.T.

P. G. (Stepney Green, London, E.).—"What puzzles me is that even *before* the filaments are alight I get a little spark when plugging in the H.T. battery lead. The set seems to work all right—in fact, I am very pleased with it—but I can't understand a current flowing, as shown by the spark, when there is no valve alight. What is wrong?

Nothing is wrong if, as we expect, you have a large, fixed condenser shunted across the H.T. The current flow that is puzzling you is simply due to the fact that every time you plug in, this "reservoir" condenser is charged up. When the set is switched off the charge slowly dissipates, so that the next time you connect up again another charging current flows for a moment, thus causing another spark.

THE CARE OF AN ACCUMULATOR.

R. P. (Cheltenham, Glos.).—"My accumulator stands in a corner beside the fireplace, and although I have only had it two or three months, the acid seems to be running low. Can I put tap water in?"

There is no doubt that you *can* put tap water in an accumulator, in just the same way that you can put your money into a pocket which has a hole in the bottom. But if you take our advice you will do neither. There are more ways than one of losing money, and one of the most certain is to treat an accumulator badly. To get the best from such an accessory you must treat it in accordance with the makers' instructions, and in nearly all cases you will find that the makers definitely recommend the use of distilled water and not tap water for refilling an accumulator.

We notice, too, that you stand the battery near the fireplace, which would account for the electrolyte evaporating quickly. This again is directly at variance with the advice given by the manufacturers, who state that the cells should be "kept in a cool place." Although the average accumulator will stand a lot of misuse, we are afraid that you are not giving yours a fair chance, and we recommend you to adhere to the makers' instructions as closely as possible.

If you have lost or mislaid these, no doubt your dealer would be able to help you, or you could obtain them direct from the manufacturers of the battery.

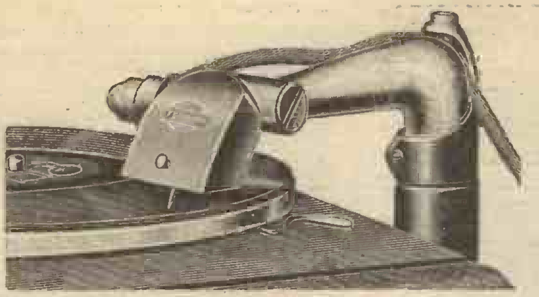
OVERHAULING A LOUD SPEAKER.

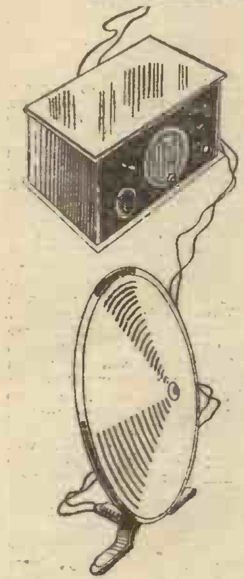
"Tommy" (Coventry, War.).—"I have had my loud speaker in use for just over two years, and although I do not use it very much

(*Continued on page 720.*)

For the Cossor Melody Maker

REDFERN'S
NEW SIZE
EBONITE LOW LOSS
COIL FORMER
7" LONG 4" OUTSIDE DIAMETER
Your Dealer can supply you
Insist on Redfern's — British & Tested.
REDFERNS RUBBER WORKS LTD., HYDE, CHESHIRE





A new field of experiment for you!

That old gramophone you have got tired of can be made to give reproduction many times better than it ever did before and all for a very small outlay.

Merely replace the soundbox with the

IGRANIC PACENT **PHONOVOX**

and connect to the amplifier and loudspeaker of your wireless set. The result is far better quality than either of them gave alone. What it amounts to is that you obtain electrical reproduction such as is being used in all de-luxe gramophones.
Get the Phonovox for Christmas and provide excellent quality dance music for the family. Remember the volume is only limited by the capacity of your amplifier.

THE PHONOVOX, Price 37/6

The following are optional:—

Plug Adaptor, 5/- **Volume Control, 7/6**

Send for List No. R.70 for further particulars.
The range of Igranic Radio Devices is the most complete in the world and they are always stocked by reputable dealers. All reports received by us of difficulty in obtaining them receive immediate attention.

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5 capacity ranges, and each in Baseboard and Panel models.

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A sound variable condenser which fills a long-felt want. Specially designed to take the place of the hitherto generally used Fixed Condenser. For use as:

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60-volt "WIRIN" 12/6
99-volt "WIRUP" 21/-
(Postage Extra.)

All types, voltages, etc., in Double and Treble capacities for H.T. and L.T. Supply. Ask your dealer for the type to suit your set and get the maximum service, or write us for full particulars.

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A. H. HUNT, Ltd. (Dept. 12), CROYDON, SURREY.

TRADE **HUNTS** MARK
They Last Longer

RADIOTORIAL QUESTIONS AND ANSWERS

(Continued from page 718.)

in the summer months, it sees a good deal of constant service one way and the other. Just lately it seems to be falling off a good deal, and reception is not as pure as it was a few months back. Certainly not half as clear as last year. My friend's loud speaker, which is of the same make but is a new model, seems to have far more life and tone on my set than my own speaker. Does this mean it is wearing out and I shall have to get a new one ? "

After two years of constant service your loud speaker needs an overhaul. Possbibly it may be a little worn, either mechanically or electrically, and in any case, it probably has accumulated a certain amount of dust which is interfering with its proper functioning. You should ask your dealer if he can send it back to the manufacturers for a test, or, failing this, we should take the matter up direct with the makers.

WHAT IS VERNIER TUNING ?

" A New Amateur " (Crowmarsh, Oxon.).—" I am afraid I shall sound an awful ignoramus, but being buried away in the country here, I do not often see a wireless shop and get very out of touch with wireless terms. The one that is puzzling me at present is " vernier." What is meant by vernier condensers and vernier tuning ? "

The word vernier applied to wireless simply means greater fineness or accuracy. You probably know how even a very slight movement of a variable condenser will alter tuning, but sometimes the very smallest movement of the main dial is an adjustment which is too coarse. In such cases the final adjustment is made on a separate control which is called a vernier control. In most of the really modern condensers the necessity for a separate vernier tuning adjustment is obviated by the use of some slow-motion device, such as gearing, which gives the same fine adjustment as a separate vernier effect.

WHAT IS THE BEST ONE-VALVE SET ?

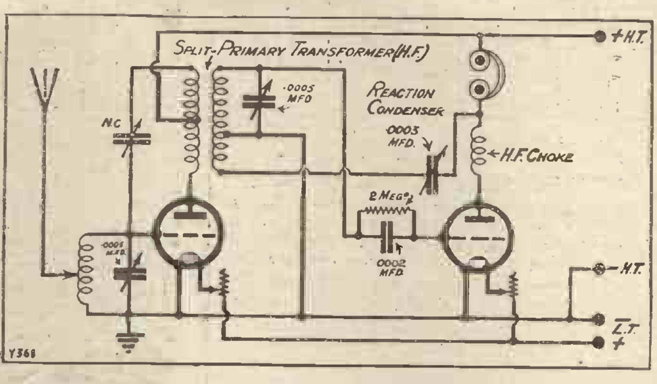
J. N. (Wells-next-the-Sea, Norfolk).—" I have been interested in wireless for years, and although funds will only allow me to have a crystal set, I always read about the valve sets in the hope that one day I shall own one. Other people's troubles are very interesting to read about, but there is one question which I have often wanted to ask, and that is—what is the *best* one-valve set? "

Your question is easily asked, but as one man's meat is another man's poison, there are always bound to be differences of opinion as to what constitutes the very best method of hooking up one valve. The most popular arrangement in vogue to-day, and one which gives uncommonly good results, is that known as the straight one-valve detector with reaction. This latter can be controlled by the swinging-coil method or by a condenser. In either form this circuit is very simple and reliable, and although robust in operation it is quite sensitive enough to bring in many long-distance foreign stations under good conditions. (In fact, with a straight one-valve circuit many " P.W." readers have succeeded in tuning in American broadcasting stations direct !) One advantage of this type of receiver is that with the magnetic (swinging coil) reaction, it works as well on the long waves, i.e. 5 X X, as on the shorter waves used by 5 G B and the other local stations.

On the other hand, there are some experimenters who prefer a circuit which is decidedly more sensitive, even though it is a little more tricky in operation. Such a circuit as the Chitos, for instance, which was introduced to the public through the pages of this journal. The Chitos set will always find warm adherents amongst those who prefer super-sensitive circuits, even though these may be a little more difficult to handle than the simple types already referred to. Nearly everyone who has tried the Chitos has said that this receiver gives better results on the

(Continued on page 722.)

WHAT IS WRONG ?



The above diagram is supposed to represent the connections of an H.F. and Detector receiver, with split-primary H.F. transformer and reaction on the secondary. But it is wrong, and would not work properly.

Next week the correct diagram will be given, and to test your skill we shall continue to publish every week a diagram in which a mistake (or mistakes) has been inserted. The correction will be published the following week, and the series will work up from a simple crystal set to multi-valvers.

No prizes are offered, but by following this series and trying to solve the problems week by week the reader cannot fail to learn a lot about radio circuits.

A CUP the girls may win

It is good that girls play games and compete for 'cups' just as boys do. The winners may seem to win by luck, but often what looks like good luck is simply good health. She who is healthy holds victory in her hand, so the most valuable cup of all may be "The Health Cup."

There are several ways to win that. Good food, fresh air, exercise, early bedtime and one other thing — food to drink. This means the 'Bournville Cup' which itself is a health cup—a wise economy because it costs no more than ordinary drinks and is simply packed with nourishment. Bournville Cocoa has a delicious chocolaty taste which wins the palate of everyone. Serve it with breakfast and supper.

Young Britain's Health Cup
BOURNVILLE COCOA

VALVE HEATING
from
Air depolarising "AD" PRIMARY CELLS

Operating EMF 1 volt, or higher, per cell, perfect simplicity; charged at home with sal-ammoniac. Most economical cell yet produced as the following examples will show.

No.	Output Not to Exceed.	Life per Zinc when used 3 hours daily.	Price per complete cell, with salt.
222	1 amp. 3–5 hrs. daily	350 days with 5 valves (each 100 m/a.)	30/-
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240	120 m/a. 3–5 hrs. daily	330 days with 1 valve (100 m/a.)	5/6

Pro rota life for other types of valves. 1 volt per cell, 2 volts 2 cells in series, etc.

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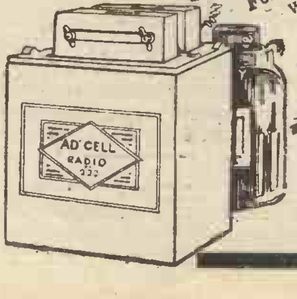
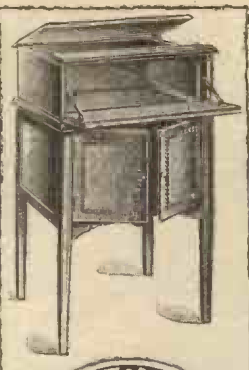




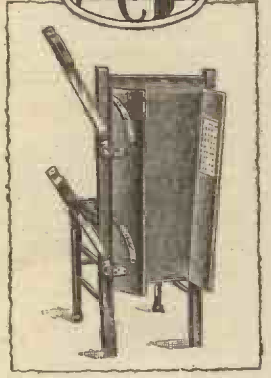
"The picture on the box"

may not be the sign of a good cigar, but a good wireless cabinet is a sure sign of a good set.

Your set deserves a V. C. Bond Cabinet. It will not only add distinction to your room as a piece of furniture, but will add to the efficiency of your apparatus.

Our cabinets are made like that—experts in radio and cabinet-making contribute to the beauty of design and sound construction which has made them so popular.

We have many designs from which you may choose, but we can make one to your special requirements too.



This combined bedroom chair and trouser-press solves the problem of the Christmas gift. It is not only a piece of good furniture, but a personal servant any man would appreciate.

For full illustrated particulars of cabinets and chairs, write or 'phone to

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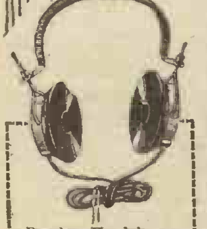

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GOODS sent C.O.D. on request. Please state on Order.

Var. Neutralising Condensers, each 2/6. Oxidised Panel Brackets, pair, 8d. Baseboard Var. Resistances, each 1/-. Baseboard Coil Plugs, each 9d. Variable Resistances, each 6d. Slow Motion Dials, each 3/6. Push-Pull Switches, each 1/-. Coloured Insulated Wire, 20 ft. for 1/6. Large Shell Insulators, 2 a 1d. Neutron Crystal, 7d. Permanent Detectors, usually 3/6, to clear, 1/3. Voltmeters, 0-10, each 2/6. Croix Transformers, 3-1 & 5-1, each 3/9. Variable Grid Leaks, each 6d. Rheostats (6 ohm), each 6d. Dundas Loudspeaker, full size, 30/-.
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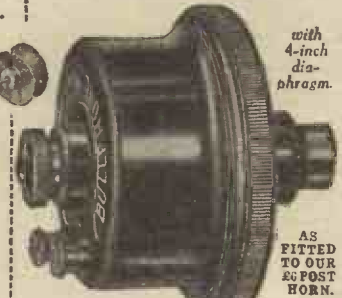

with 4-inch diaphragm.

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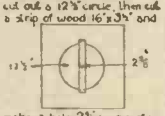

From a 3 ply board, 3ft square cut out a 12⅝" circle, then cut a strip of wood 16"x3½" and make a hole 2⅝" dia in centre, this will carry the unit. Fix strip to board as shown.

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21 ins. high, with 14-inch Bell Mahogany finished, with plated arm and stand.

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PANEL PLATE TUNER UNIT

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Price
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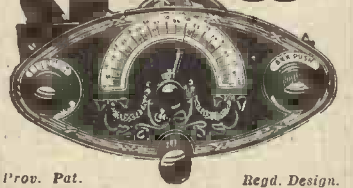

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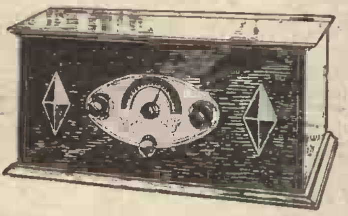
We are receiving by every post eulogistic testimonials, and there is no doubt that this remarkable Unit has come as a boon to the home constructor and fills a long-felt want.



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These new models were the sensation of the recent London Radio Exhibition, representing the last word in Value. Constructed throughout of the very finest material and housed in handsome oak cabinets enclosing all batteries, valves, etc. No loose wires nor coils to change. Extraordinary range and exceptional volume. Prices (set only):

£5 0 0 (2-valve set)
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1/2 each

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Send For Lists

RADIOTORIAL QUESTIONS AND ANSWERS

(*Continued from page 720.*)

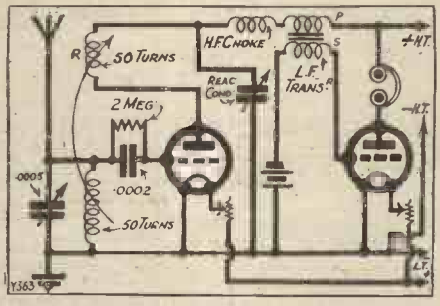
short waves than an ordinary straight one-valve set, but it suffers from the disadvantage that it cannot work equally well upon the longer waves, such as 5 X X uses.

Many other interesting circuits might be named as being specially suitable to particular conditions, but undoubtedly the most popular one-valve circuit is the good old straight circuit, in which the valve acts as a detector with reaction. In average conditions this is sure to give satisfaction, but where the conditions are in any way abnormal, or the requirements are in some way out of the ordinary, expert advice may be obtained from the Technical Query Department, as to the receiver which is most likely to give maximum satisfaction in the special circumstances. (The charge is quite a nominal one, and full particulars are obtainable upon application.)

"TERRIBLE TROUBLE" WITH AN AMPLIFIER.

"TROUBLED" (Abingdon, Berks).—"I am in terrible trouble with my set, and I hope you can help me out, for I don't know what my father will say. We started wireless with a crystal set, and then last year we had a one-valve amplifier in order to get better signals. This was satisfactory in a way but we could not "reach out," so last month I saved up enough to get the parts to build the Reinartz one-valve set which was given away with "P.W." on October 15th (Blue Print No. 30). With this, I thought, we shall be able to add the amplifier and possibly get Daventry on a loud speaker, as well as reaching out for foreign stations. But I have been bitterly disappointed. When I try to connect up the amplifier to the one-valve set, the L.T. battery wires "spark" when I join up, and if I keep them together more than a minute they start to get quite hot. Evidently something is seriously wrong. What can I do? I am afraid to tell my father about it."

A DETECTOR AND LOW-FREQUENCY AMPLIFIER.



The correct connections for a Detector and L.F. receiver with condenser-controlled reaction are shown above.

In the "What is Wrong" diagram last week the H.T. negative terminal, 'phones, and choke were omitted. The grid-bias-battery was reversed, and there was no H.T. to the plate of the 1st valve, and no L.T across the filament of the 2nd valve.

There is no need for you to get into a panic, "Troubled," because you are experiencing quite a common fault, which, fortunately, is very easily remedied. What has happened is this. In the amplifier that you have, the H.T. negative is joined to L.T. positive wire, whilst in the Blue Print (No. 30) set the H.T. negative is joined to L.T. negative. This means that if you connect up all the terminals in the way shown, the L.T. battery is shorting, and consequently will be damaged; but you will find that there is no earthly need to connect up all the terminals. Try connecting up again to the terminals as marked on the instruments, but be sure *not* to connect a wire to the H.T. negative terminal on the amplifier. Ignore that terminal altogether, and leave it without any connection externally whatever. In all probability you will find that the

(*Continued on page 724.*)

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Panel type, 3/6. Baseboard type, 3/9.

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Assured with our new Insulating Liner, Jars, 1/3 doz. plain; 1/6 doz. waxed; Special Zincs, 1/- doz.; High-Capacity Sacs, 1/6 doz.; Perforated Liners, 4d. doz. Post Free on three dozen Units and over, including special divided carton suitable as a container. Send 6d. for sample complete unit, particulars and instructions. We stock Seamless Moulded Cone Parts. Telephones and Loud Speakers re-wound
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COMPLETE SETS, LOUD SPEAKERS, COMPONENTS, Etc.
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Coil No. . . .	25	35	40	50	60	75	100	125	150	200	300	X60	X200
·00003 mfd.	73	90	126	151	188	231	297	498	565	595	942	188	595
·00025 mfd.	160	225	283	316	391	500	652	995	1180	1410	2005	391	1410
·0005 mfd.	225	300	386	432	555	680	885	1330	1625	1960	2755	555	1960
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Modern radio circuits call for critical tuning—critical tuning demands precision condensers—precision condensers means Pye condensers for accuracy and reliability. Pye Precision condensers are scientific instruments made one at a time with great care. You need them to get the best from your set.

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The famous

LOEWE High Vacuum Resistances
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are now available in Great Britain. They have been a full success on the Continent, and will, no doubt, be equally favoured by the British public.

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Will obtain Foreign Stations on the Speaker.

If you get it from Bush House it's the best

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Two required for each hole

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Hole in Bush	6BA,	4BA,	2BA,	¼",	5/16",	⅜",	7/16"
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(Complete List of sizes free on application)

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RADIOTORIAL QUESTIONS AND ANSWERS

(Continued from page 722.)

amplifier then works in a perfectly satisfactory manner, and we hope that both you and your father will be pleased with it.

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"ONLY A NEWCOMER" (Sheffield).—"What seems strange to me is that when Sheffield 'switches over' I can hear London calling as plain as Sheffield was. Does it come to my aerial from London or Sheffield?"

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Full details, including a revised scale of charges, can be obtained direct from the Technical Query Dept., "Popular Wireless," Fleetway House. Farringdon Street, London, E.C.4.

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Using the standard "Becol" ribbed former, and number 34 D.S.C. wire, 90 turns will be required for reaction. The grid winding should consist of 250 turns, tapped at 70, 90, and 110 turns.

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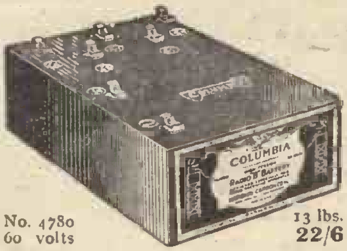

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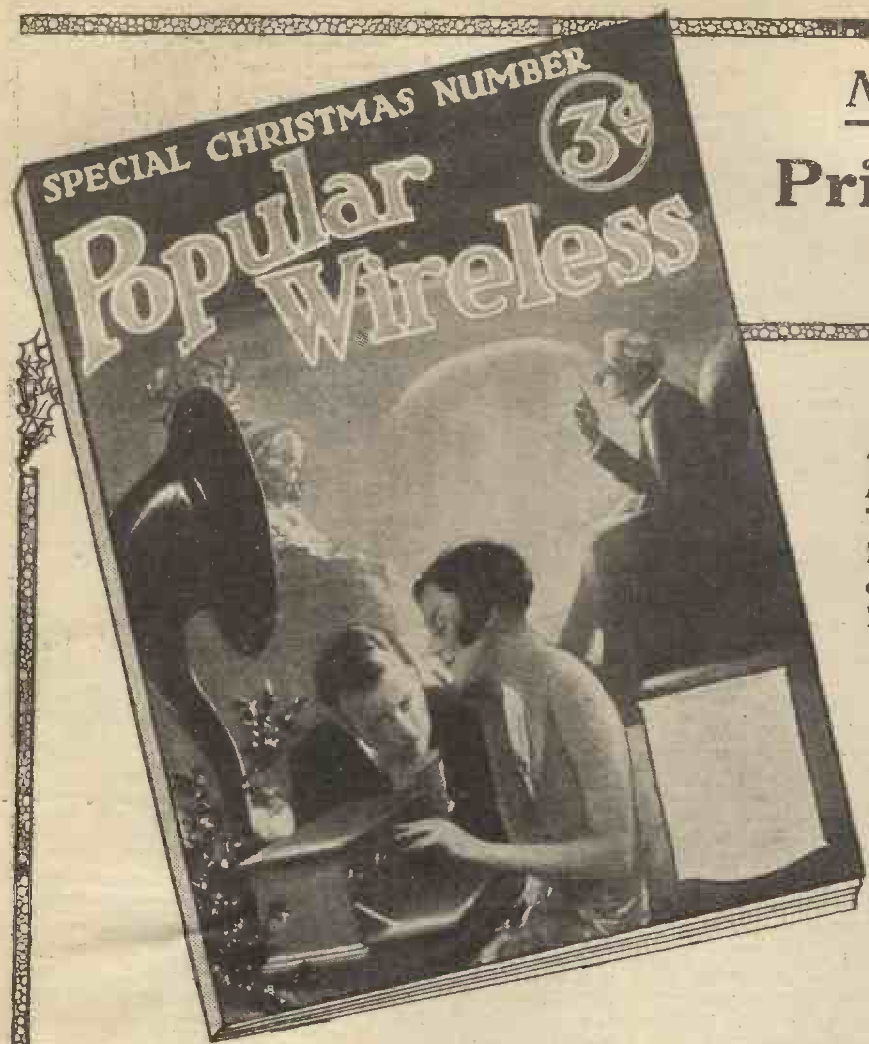

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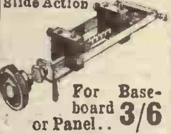

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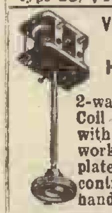

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SHORT-WAVE NOTES.

By W. L. S.

ONE of the strangest features of short-wave work is the extraordinary way in which conditions will change in a comparatively short space of time with absolutely no apparent reason. To take a case in point, Wednesday, November 16th, was one of the best nights for the reception of the United States amateurs that the writer can ever remember. Fourth district stations were coming in well on a two-valve receiver as early as 8 p.m. At 11.30 all districts were audible.

No watch was kept on the Thursday and Friday, but on the Saturday and Sunday it was practically impossible to log an "N U" of any description. It is also interesting to note that last year's "rule" still holds good—namely, that when the N U stations are weak or inaudible, the Brazilians come in very well indeed.

R. C. Coupling Best.

At the time of writing conditions for transatlantic work generally seem very poor, yet 2 X A D on 22 metres, relaying a baseball match, is being received at good loud-speaker strength with three valves.

It is well worth while experimenting with resistance-coupled note magnifiers for short-wave work, as it appears in quite a number of cases that annoying noises resembling artificial atmospherics are extraneous noises picked up direct on the primary of the low frequency transformer. Suffice it to say that the writer is now using *two* resistance-coupled stages, giving an amplification very little in excess of that previously obtained with one transformer stage (with a step-up of 4½ : 1), and although the signals are very slightly stronger than before, a good percentage of the mush has disappeared. A certain type of mush, if one may use the expression, seems to have remained, but there is no doubting the improvement over the old set.

An anode rectifier also improves matters, for a fair percentage of the "mush" is in some cases due simply to a faulty grid condenser or leak on the detector, and accordingly disappears when they are removed.

New French Station?

From the results of the Washington Conference it seems probable that amateurs will in future take rather more interest in the 80- or 90-metre band of wave-lengths. It was only a few nights ago that a real "old stager" remarked to the writer that he had never heard the New Zealand and Australian stations at such a strength as he used to receive them on 90 metres or so, and this is certainly true. Meanwhile a perfectly good band of kilocycles is going begging!

K D K A on approximately 60 metres is another station that has been "coming across" remarkably well during the past few weeks. By 11 p.m. his strength has occasionally been comparable with that of 2 L O! There is also a very powerful French station working on the same wave-length, and the writer would be very glad to hear from readers who have heard this station.

HALF & HALF
Only half the weight of others! Only half the size!—Daimon L.T. Batteries. No battery of the same size as a Daimon has a lower internal resistance. No battery gives quieter reception background, recuperates easier, or lasts longer. But then, Daimon are made by the oldest battery manufacturers in Europe. 60 volts, 9/6; 100 volts, 15/6; Grid Bias (9 volt), 1/10; L.T., 1/10 and 4/- each. In order to meet competition we have now produced the DAIMON JUNIOR, 60 volts, 7/11; 100 volts, 12/11. All good dealers or direct LOUIS HOLZMAN, 34, Kingsway, W.C.2. Telephone: Holborn 6209.
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36, Hindmans Road, E. Dulwich, London, S.E.22

TAYLEX WET H.T. BATTERIES.
New Prices: Jars, 1/3. Sacs, 1/2. Zincs, 11d. Sample doz. (18 volts), complete with bands and electrolyte, 4/3, post 9d. Sample unit, 6d. 16 page booklet free. Bargain list free. AMPLIFIERS: 1-valve, 19/-; 2-valve, 30/-. 2-valve ALL-STATION SET, £4.—P. TAYLOR, 57, Studley Rd. Stockwell, London

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DX PLUG-IN COILS
From 1/- D X COILS, LTD., London, E.8.

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Any Crystal Set can pick up the new alternative programmes and greatly improve power, tone and range by fitting this wonderful new mineral.
100% BETTER RECEPTION GUARANTEED.
Nothing like it before. Scrap your old Crystal now and convert your set into a high-power valveless receiver.
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THE NEW STUTZBERG
M.B.17. THE SUPER NATURAL CRYSTAL

THE "PROGRESSIVE" TWO.

(Continued from page 695.)

The flexible from the ·0002 mfd. fixed condenser should first of all be taken to the second tapping from the bottom of the coil, and when the handling of the set has been thoroughly mastered it can be taken to the lower tapping. This increases the selectivity of the receiver and makes the tuning somewhat keener.

You will find that the original ·0005 mfd. variable condenser—which, for clarity, I will in future refer to as the *centre* variable—is much the closer in tuning, and that the aerial tuning variable is somewhat broad in its control. These two variables should be rotated more or less together in the first instance, but as the desired station is heard the reaction condenser and the centre variable can be "balanced," and subsequently the aerial variable adjusted until loudest signals result.

An incidental advantage which results from the use of the H.F. circuit adopted is that the H.F. stage can very easily be cut out in the Progressive set. To do this, all that is necessary is to withdraw the H.F. valve from its socket, disconnect the flexible lead from the grid coil, and take the aerial flexible lead to a tapping on the grid coil instead (as in the case of the "Progressive" One).

The Third Valve.

Very simple, isn't it ? And it is also much more efficient than switching.

Now I am going to leave you for a while to get the two valves going properly.

You must not even think about the third valve until you are satisfied that these two valves are giving two-valve results, and that you can handle the receiver with the aplomb of an expert. I want you to be so closely acquainted with the controls of the set that when you do add the third valve, you will be able to tune stations in direct on to the loud speaker. And then, when I have completed the programme and you have hooked up the fourth valve, you will be able to challenge with confidence any average five-valve man to a "station grabbing" contest.

Next time we come to the first L.F. valve which is to be transformer-coupled. You can, if you like, leave this week's work over and connect up the first L.F. before bringing in the H.F. But I do not advise this procedure because it is much more difficult to tell whether an H.F. stage is working really properly when it is tacked on to a two-valver than when it is added to a one-valve set.

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The Benjamin Standard is known throughout the Radio trade. It stands for a greater efficiency, a far higher degree of excellence and an unequalled value. Every component that is stamped with the name of "Benjamin" is the very best of its class.

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has its windings protected inside the dial. Three windings—6, 15 and 30 ohms. Price 2/9.

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Twelve feet of one inch copper in 11½″ × 1½″ giving 288 sq. in. of surface area. The inclined plane of the plates ensures perfect contact. Price 5/9.

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for Alternating Current 200-240 v. 50 cycles. Delivers current for loads up to twelve valves, giving 180 volts for power valve. A really dry eliminator. No acids, no liquids, no hum. £7 15 0.

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No other valve-holder so efficiently disperses microphonic noises and absorbs shocks so thoroughly. Valves free to float in any direction. Price 2/-.

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THE BENJAMIN ELECTRIC LTD.
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TABLE ELECTRIC PROJECTORS for Photo Slide or Home Television experiments. 4 Magnif. and focus lenses, swivel stand. Socket cord and plug for supply mains or battery. Sale 25/-. Few only. Handsome present. £5 Violina Loud Speakers for 25/-.
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VALVE BARGAINS. AC to DC 50 m/a Cossor, B.T.H., M.O., &c., with Holder, 8/6. List 25/-. Neons, 2/6. 8 v. Grid Bias Battery, 1/-.
BARGAIN RECEIVERS. Royalty paid. All first-class make. Free trial. 2-Valve, No. 33 Marconi plug coils, all waves, 50/-. 2-Valve Mark 32, 250 to 1,800 metres, £4. Western Electric 3-Valve, £6 5s. 3-Valve Aircraft, £4. Polar 4, Pol. Cab., £6 10s. 5-Valve R.A.F. with Valves, £5. 6-Valve Marconi de Luxe, £8. Sterling Surplus Anodian, £5 10s. Marconi R.B.10 Crystal and 1-Valve closed Cabinet. Complete with Valve, 22/6. Marconi Screened 6-Valve, £12. Cost £50. Paxolin Tubes, 3¼ in. × 2½ in., 4d. each; 2¾ in. × 2½ in., 3d. each. All parts for Eliminators.
MASTS. R.A.F. Steel Tubes, 15 ft., 7/6; 20 ft., 10/-; 30 ft., 14/-, in 2 ft. 8½ in. × 1½ in. sections. Heavy Mast sections, 4 ft. 3 in. long, 2½ in., 5/- each.
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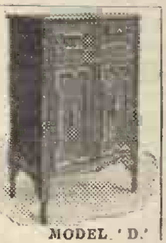
are DUSTPROOF and house the whole apparatus, leaving no parts to be interfered with. Beautiful in Design and Finish. Made on mass production lines, hence the low price. Provision is made to take panels up to 30" and baseboard 20" deep. Special Cabinets for the Solodyne, New Family Four, Long Range Five, "M.W." Five. A "Three" for the New Valve, All-British Six, etc., now ready.



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From £4 : 15 : 0

Write for full particulars FREE.—
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COSSOR MELODY MAKER COILS, 5/11.
Cabinet, oak, polished, 30/-. ·0005 S.L.F. Variable Condensers, 3/11. British Dull Emitters, 5/-. 4" Dials, 1/3. Vernier, 3/11. Lotus type Valve-holders, 1/3. Baseboard Rheostats, 6, 15, or 30 ohms, 1/-. All goods post free. *Trade supplied.*—
Tennants Wireless, Hylton Rd., Sunderland.

ETON Primary **H.T. Battery.** P.1 Porous Pot Cells, S1 and S2 Sac Cells. All complete for assembly.

	1 cell.	6 cells.	12 cells.	30 cells.
P1	6½d	3/3	5/9	14/-.
S1	6d	3/-	5/3	12/-.
S2	4½d	2/6	3/10	9/6.

Send 1½d stamp for booklet giving full particulars to: The ETON GLASS BATTERY CO.,
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UNIDYNE 4-ELECTRODE VALVES

We are now the sole suppliers of the genuine U.C. and Thorpe valves, as specially tested and recommended by the "Unidyne" inventors and "Popular Wireless." U.O.5 and Thorpe K.4. (both 4-electrode 5-pin valves). Post free. *Only direct from*—
6/11 *Cash with Order.*
UNIDYNE VALVE CO.,
1, CHARING CROSS, LONDON, S.W.1

TECHNICAL NOTES.

(Continued from page 698.)

or in total darkness. The system also makes use of what are called "marker beams" placed at intervals of about 25 miles along the air route, these acting as radio "milestones." In addition to this, radio telephony is used to keep the pilot informed of landing conditions and weather prospects. The control centre is also equipped with receiving apparatus so that messages may be received from aeroplanes which are provided with transmitters.

Microphone versus Ear.

The human ear is remarkably sensitive as an acoustical pick-up device, and until the advent of broadcasting, in fact, until very recently, electrical and suchlike devices for picking up sound were very much inferior to the ear in sensitiveness.

With the increasing demands upon the microphone, however, great improvements have been made in pick-up devices, and now the broadcast microphone may even surpass the ear considerably in sensitivity.

A curious example of this was noticed some little time ago, during one of the well-known attempts to broadcast the song of the nightingale. Listeners heard the sound of a bird which was presumed to be some little distance from the microphone, whilst the engineers in charge of operations failed entirely to hear the sound. It is presumable that the microphone picked up the sound, whereas the engineers were unable to do so. The sound picked up by the microphone was, of course, amplified in the usual way and reached the broadcast listeners, although those in charge of operations were even unaware that any song was being received at all.

Socket Power.

With the considerable advances in the design of power-supply devices, for taking the radio power from the electric light, improved components and subsidiary devices have become more and more necessary. One of the essential components, of course, is the smoothing condenser, or set of condensers, and in cases where fairly high output voltages are required, the condensers must be properly designed and constructed if they are not to prove the cause of breakdown trouble.

I notice that one firm is now producing special condensers contained in a metal housing about 4 in. square by 5 in. high, the condenser having a capacity up to 6 mfd., and being provided with stout projecting terminals at the base of the metal container. These condensers are designed for continuous use with direct-current voltages up to 1,000 volts, which makes them particularly useful in high-voltage power units giving output voltages of as much as 300 to 500 volts. It is important that the filter condensers should be capable of withstanding voltages considerably in excess of the rated output, for various reasons, which you will see at once. These condensers are claimed to have a capacity within about 10 per cent of the rated value. They are extremely compact and very small for their electrostatic capacity. The metal container of the condenser is completely filled up with insulating compound so as to seal in the condensers and provide protection from atmospheric and other causes.

Loud-Speaker Improvements.

I suppose most loud-speaker reproducer units are fitted with an adjusting screw for varying the sensitivity. This adjuster is not, however, always an unmixed blessing, for not only is its use, or misuse, frequently responsible for much distortion—which is often blamed upon other parts of the circuit—but also the careless or unskilled use of the adjusting screw may result in permanent damage to the electro-magnetic unit.

An enterprising American manufacturer has placed on the market a very handy and compact loud-speaker unit in which these drawbacks are entirely avoided by the simple process of adjusting the unit once and for all before it is sent out from the factory. As no adjuster screw is provided, it is impossible for the user in ordinary circumstances to interfere with the reproducer in any way.

In addition to being inexpensive, it is provided with an adapter for the outlet tube so that it may be fitted to most existing types of horn.

Personally, I think there is a good deal to be said for this permanently-adjusted type of reproducer, not only because it prevents trouble of all kinds, but because the simplification which results in the manufacture or assembly—by the omission of the adjusting system—permits of it being produced at a distinctly lower price.

A Trouble Saver.

A very simple battery-testing device now being made by the Beede Instrument Company, and known as the "Test-A-Bat," consists of a small "watch" meter with its dial marked into three sections, instead of being calibrated in the usual way. These three sections are respectively labelled "start charge," "O.K." and "stop charge." The meter is provided with two metal brackets by means of which it may be permanently attached to the terminals of a storage battery. There is a small button on the edge of the meter which, when depressed, closes the circuit and gives a reading. The meter is, therefore, always ready for use, but current only flows when the button-switch is depressed. In this way the condition of the battery can always be determined instantly and with a minimum of trouble.

DID YOU KNOW THAT . . . .

WHEN a set slowly builds itself up into a tremendous howl the trouble is generally due to the fact that the loud speaker is too close to the set or is pointing directly towards it?

* * *

If you are running long leads round the house so that the loud speaker can be used in different rooms, it is a real economy to use a choke-coupled or a transformer-coupled output, to prevent H.T. leakage?

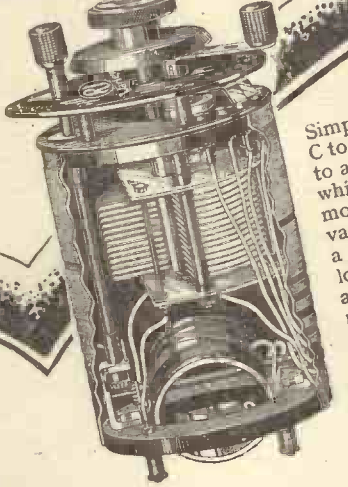
* * *

The long contact on a flashlamp cell is the negative, and the short one is the positive?

* * *

Distortion due to high-frequency current getting in on the low-frequency side of a receiver may be prevented by the insertion of a high resistance, in series with the grids of low-frequency valves?

ALTERNATIVE PROGRAMMES WITH CERTAINTY



Simply move the switch from, say, Stud C to D, and one programme gives place to another with an ease and certainty which is hardly credible. This new model "A" incorporates a ·0005 mfd. variable condenser—in fact, it is almost a complete receiver in itself. All the long-wave programmes are available, and maximum efficiency over the whole range of wave-lengths is assured by the wonderful magnetic reaction operated by means of bevelled gearing.

PRICE COMPLETE £2 7s. 6d.

Model "B"—a really wonderful achievement—is specially designed for neutrodyne work, though, as a matter of fact, so wide is its application that it may well be termed a universal tuner. It embodies the most modern facilities for greater selectivity, H.F. neutralizing, capacity and magnetic reaction. Reinartz and capacity controlled reaction, etc. A simple turn of the switch makes all these advantages equally applicable in the case of both long and short waves.

PRICE COMPLETE - - - £1 17s. 6d.

The popularity of the Standard Retroactive Tuner has steadily grown since it was placed on the market. The ease and certainty with which it enables alternative programmes to be received has still further increased its value **as a complete tuning unit which eliminates plug-in coils, and ensures correct and efficient aerial reaction over a very wide wave-length band.**

No matter what re-distribution of wave-lengths may take place in any future regional scheme, there is no possibility of these Tuners becoming obsolete, owing to the very wide waveband they cover.

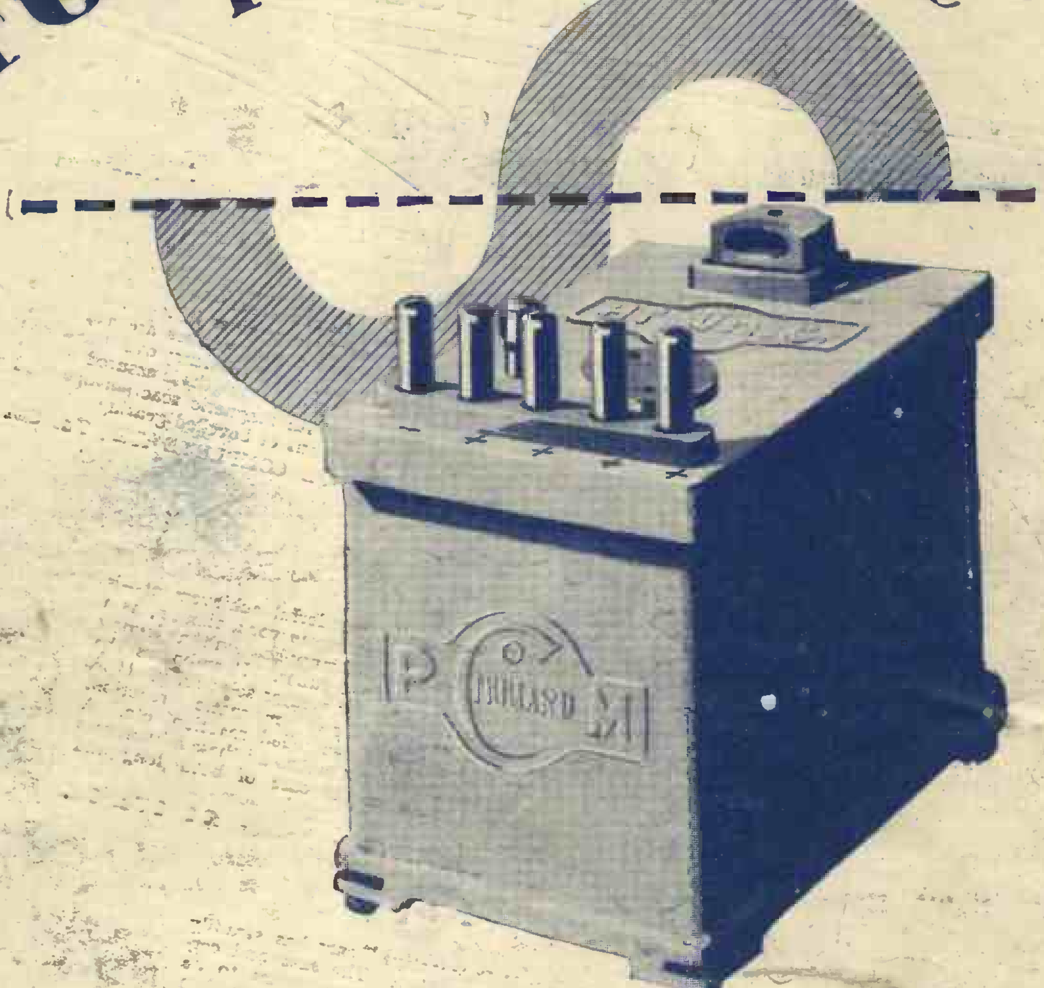
PRICE COMPLETE - - - - £1 19s. 6d.

Illustrated 12-page Booklet with full particulars of our complete range of Retroactive Tuners, and some interesting circuits, free on application.

THE Varley LTD. MARK OF BETTER RADIO

KINGSWAY HOUSE, 103, KINGSWAY,
LONDON, W.C.2. *Telephone: Holborn 5303*

FULL WAVE
For full measure



DEMAND a *full wave* unit because it makes the most of the energy it takes from the mains—makes silent operation doubly sure and gives you all the power you ever want.

Only a Mullard Full Wave H.T. Supply Unit will satisfy you; safe, free from controls and with four positive tappings. Obtainable from all radio dealers.

For A.C. mains. Price - £7.10.0 complete.

Keep your accumulator at full strength by using the Mullard L.T. Battery Charger for A.C. mains. £4.0.0 complete.

Mullard
MASTER • RADIO

THE MULLARD WIRELESS SERVICE CO. LTD., MULLARD HOUSE, DENMARK STREET, W.C.2

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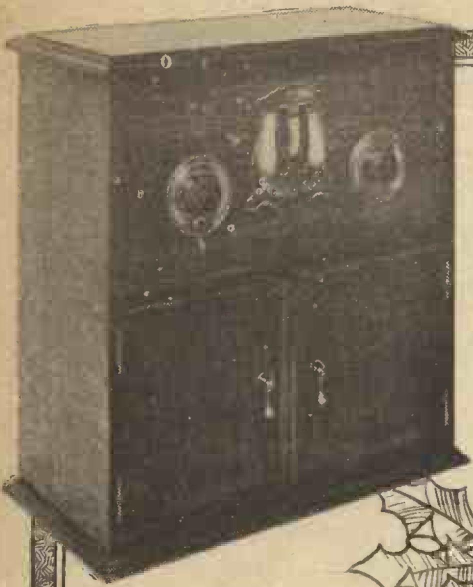
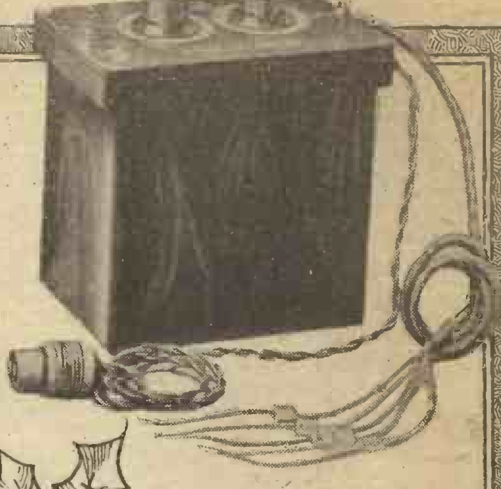
XMAS RADIO PRESENTS



The handsome set shown to the left is the Brandeset IIIA, which will receive English and Continental stations at good loud-speaker strength. The three valves are arranged as detector and 2 low-frequency amplifiers, and the receiver is easily operated by the single control condenser shown. The cabinet is of polished oak, and the price of the receiver is £6 15s. (excluding royalty).

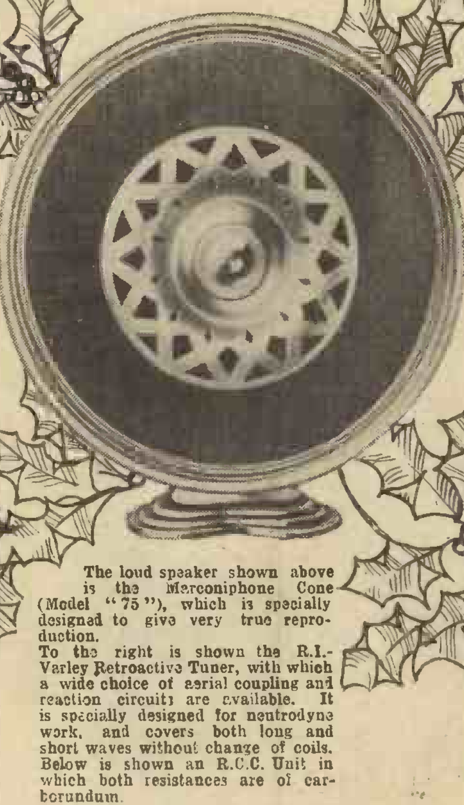


The more general use of multi-valve receivers has resulted in a comparatively heavy drain upon H.T. supply, to meet which many excellent H.T. units have been evolved. By means of a plug-in adaptor, such units can be connected to the electric-light wiring in a moment.

The instrument shown above is the Dubilier H.T. Supply Unit, Model No. 2, and is provided with flexible tappings for four separate high-tension voltages.

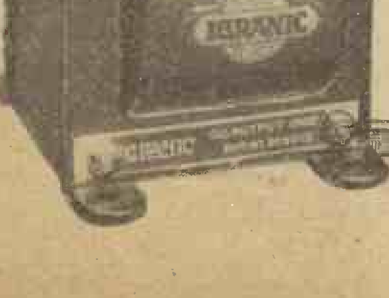
For the modern loud-speaker set, employing power valves, a separate output circuit is almost indispensable. Such an arrangement diverts the steady anode current of the last valve from the loud-speaker windings, thus protecting the loud speaker and preventing demagnetization.

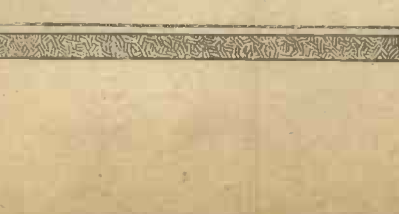
The Igranic C.C. (Choke Capacity) Output Unit, shown below, can easily be built into a set or added externally as a separate output unit.

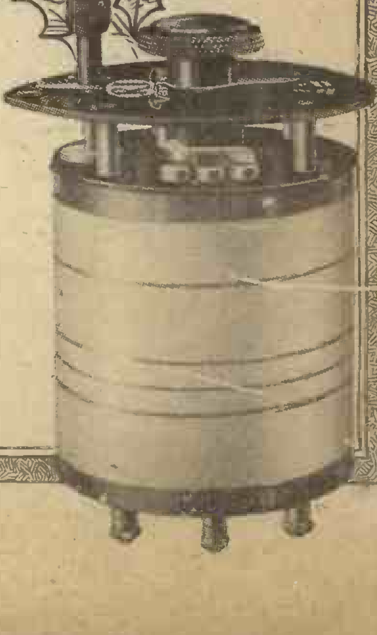


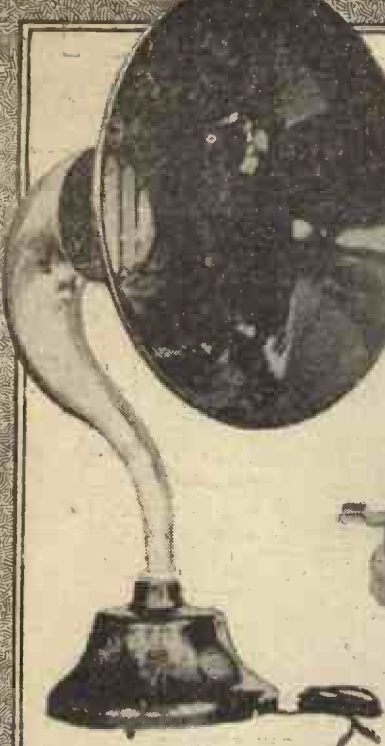
The loud speaker shown above is the Marconiphone Cone (Model "75"), which is specially designed to give very true reproduction.

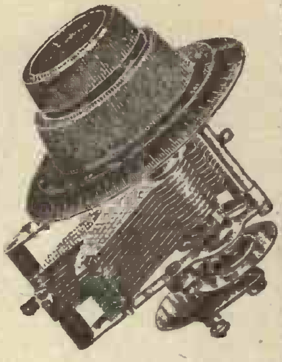
To the right is shown the R.I.-Varley Retroactive Tuner, with which a wide choice of aerial coupling and reaction circuits are available. It is specially designed for neutrodyne work, and covers both long and short waves without change of coils. Below is shown an R.C.C. Unit in which both resistances are of carborundum.



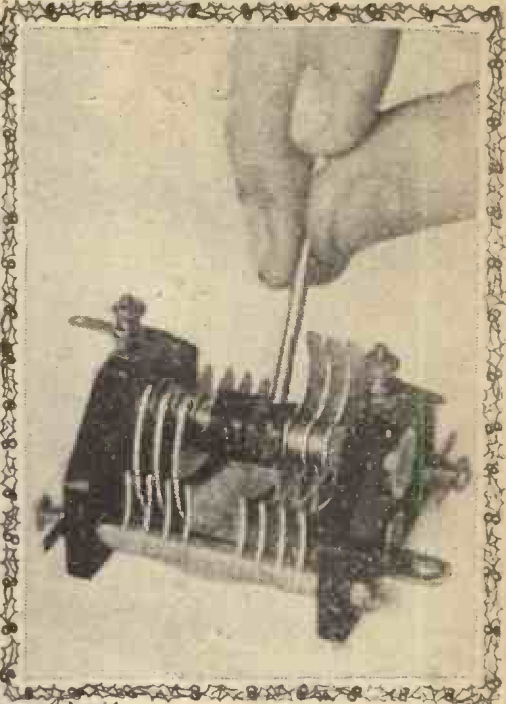




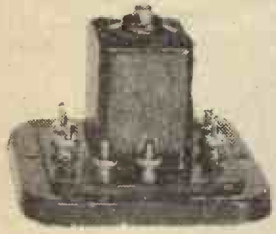


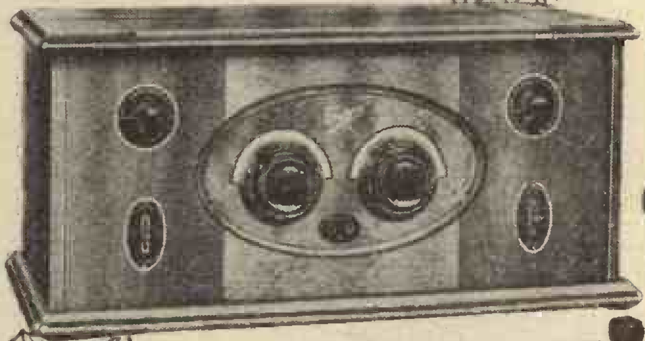


The B.T.H. loud-speaker shown to the left is fitted with a screen which ensures that its working parts are continually protected from damage. The tuning condenser (right) is a "J.B." product.



The "Varo-Fix" (Lamplugh) is a filament resistance for baseboard mounting. To the right is a double neutralising condenser (Peto-Scott).

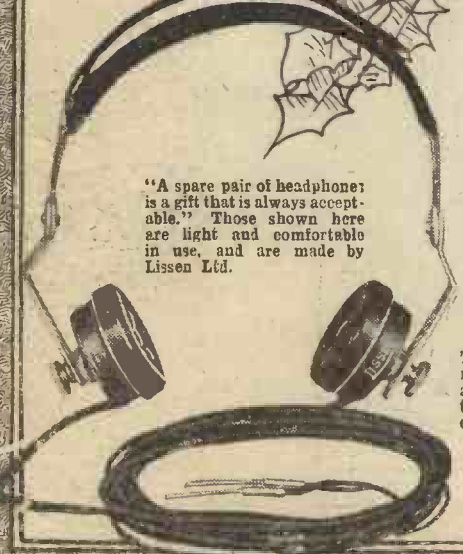




Above is a Remote Control relay (Lotus). The receiver shown to the right is the Standard Burndept Ethodyne, which employs a 7-valve superheterodyne circuit. The set covers two different wave-length ranges—250 to 550 metres, and 1,000 to 2,000 metres—and the whole of the tuning is done upon the two knobs in the centre of the panel.

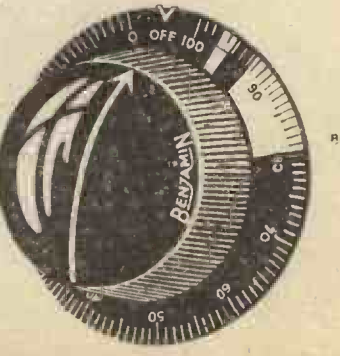
A "Lotus" plug and socket for Remote Control.

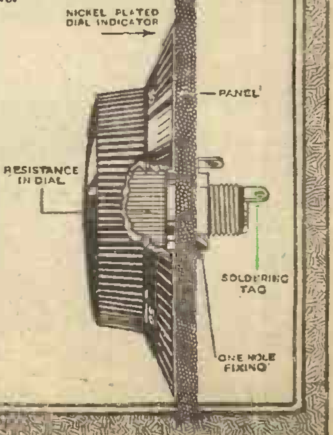
The H.T. Battery Eliminator shown above is made by E. K. Cole.

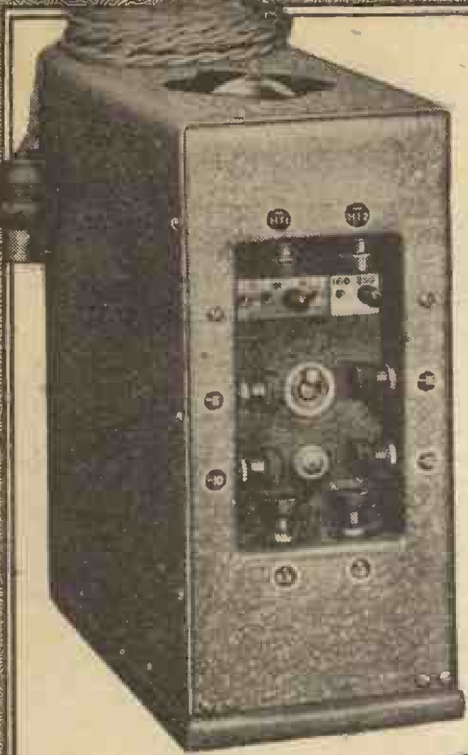


"A spare pair of headphones is a gift that is always acceptable." Those shown here are light and comfortable in use, and are made by Lissen Ltd.

The Unit above (Goodman) is designed to drive a cone loud speaker. To the right is a novel self-contained rheostat.







When the house is wired for A.C. mains, the Cosmos Eliminator shown above does away with the need for H.T. and Grid Bias batteries, and provides steady voltages at a low cost.
It incorporates a special smoothing system, and the makers (Metro-Vick Supplies, Ltd.) have found that it can successfully be used for multi-valve sets even in districts where the mains are "noisy."

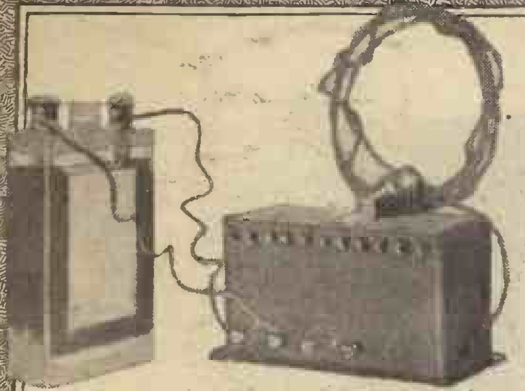
The 5-valve Portable Receiver to the right is completely self-contained and covers the Daventry (5 X X) tuning range as well as that of local stations. Made by L. McMichael, Ltd., it incorporates a cone-type loud speaker, and utilises 2-volt valves.

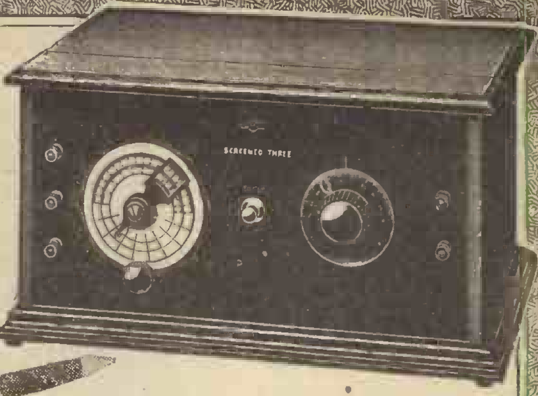
Below is shown one of the popular Lewcos Binocular Coils, inserted in its holder.

The S.S.410 H.F. is one of the well-known "Six-Sixty" valves, that show absolutely no sign of glow when operating at the rated voltage. This feature not only ensures long life to the valves, but also means a great reduction in the running costs.

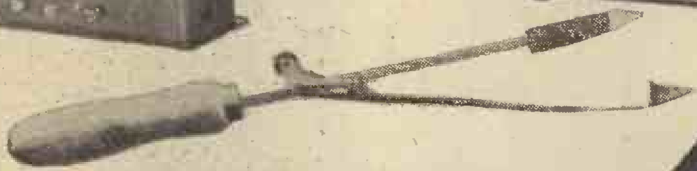
Fixed condensers always make an acceptable present, and the "T.C.C." models (shown below) have the advantage of that firm's great experience in the construction of this class of component. They are arranged for either "screw-down" or soldered connections.

A special feature of the new Amplion Cone Loud Speaker—shown to the left—is the novel easel support. This has curved ends which act as feet when the loud speaker is standing, or as hooks by which it can be hung from the picture rail. A spring catch is provided by which the support is clipped flat against the back of the frame when the instrument is used in the latter position.





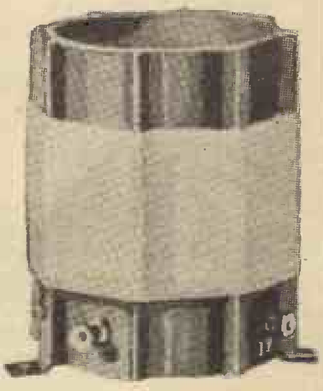
The "Screened Three" receiver, shown to the right, is one of the well-known "Magnum" lines, produced by Burne-Jones & Co., Ltd. The circuit employed is H.F., Det. & L.F., the H.F. transformer being of the split-primary type. To the left is the Ferranti Permanent Trickle Charger, for charging accumulators from A.C. mains.



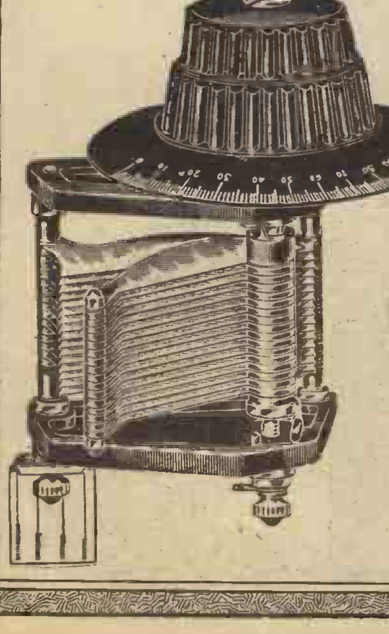
The Peerpoint Soldering Iron (above) has a special cap, as shown, which is detachable and can be removed whilst the bit is being heated.

To the left is an "Efesca" eliminator (Falk, Stadelmann & Co.), of the completely-screened type, whilst to the right is a "Gecophone" Plaque Cone Loud Speaker, which is priced at £4 10s.

The coil in the centre of the page ("Atlas") is useful to increase selectivity. When the ordinary plug-in aerial coil gives a "background" of another station, it can be replaced by one of the type shown, which has additional terminals for the A. & E. leads.



The Low-loss Coil former shown to the right is made of ebonite by Redfern's (of "Ebonart" fame). It is fitted with terminals to which the ends of the windings can be taken.



This semi-circular component is a Benjamin earthing device. To the left is an Ormond variable condenser. The maximum capacity of this is ·0005 mfd., and it is suitable for fine tuning, being fitted with a large separate vernier control knob.

The powerful receiver shown below is made by the Bowyer-Lowe Co., Ltd. It employs the famous super-heterodyne circuit, which gives an almost unlimited range of reception.

The "Constant" Two

An H.F. and Det. receiver having only one tuning control and maintaining constant sensitivity over the whole tuning range.

By PERCY W. HARRIS, M.I.R.E.

LAST week I described my new circuit which gives a very useful constancy of reaction coupling by a method not heretofore utilised, making possible very sensitive single-control receivers utilising but one tuned circuit. This means, of course, the absence of ganged condensers, with their attendant complications, which heretofore have been necessary in sensitive single-controlled sets.

TEST REPORT.

This receiver was tried out on the usual rather inefficient test aerial employed for the customary routine tests of "P.W." sets, the height being 15 ft. at one end, and 12 ft. at the other. It was immediately found that a remarkable degree of uniformity of sensitivity had been achieved, and it was possible to run from top to bottom of the tuning range and bring in stations at intervals all the way without touching the reaction control, and without oscillating at any point.

Apparently, as a result of the increased damping produced by the aerial, at the lower end of the scale the set was a little further from the oscillation point here, but this effect was not noticeable and did not prevent several stations being picked up at this part of the scale.

It is considered that on this aerial, in the course of an average night, it would be possible to tune in about ten stations at satisfactory 'phone strength, with a constant reaction setting, that is to say, by turning the tuning dial alone, and this indicates a higher degree of constant sensitivity without reaction adjustment than has been exhibited by any set previously tested.

It was interesting to note that the aerial damping was not being used to hold the set down to any noticeable extent, since aerial and earth could be disconnected without causing it to break into oscillation.

Selectivity, as might be expected from any receiver incorporating only a single tuned circuit of normal type, was only moderate, although sufficient for general purposes. In the local area of a main station it would no doubt be advisable to use a good type of wave-trap.

THE "P.W." RESEARCH AND CONSTRUCTION DEPT.

For a long time I have been endeavouring to evolve a receiver which would give the sensitivity of a skilfully handled single-valve reaction receiver with its two controls, with but only one control which can be operated by the most inexperienced reader, without any risk of oscillation and interference. If such a receiver can be evolved it should represent a very big step forward in radio. I have carefully investigated a number of systems put forward with this idea, the most promising so far being the Loftin-White, but this last proved to be exceedingly tricky in actual use if high sensitivity was required. Furthermore, special coils had to be used, while such items as a change of valve, aerial, and so forth, made a great deal of difference to the results obtainable. My new system, developed along lines entirely different from the Loftin-White, possesses the following features:

1. All standard components are used.
2. Suitable valves are obtainable from every maker.
3. Careful tests show that 2-, 4-, and 6-volt valves all work well with it.
4. A preliminary adjustment can be made to the set which enables ten or twelve stations to be received after dark at clear headphone strength on an average aerial—on a good aerial more still.
5. Any form of note magnifier, one or two stages, can be simply added, giving a loud-speaker set with only one control.
6. Once adjusted the set is perfectly "safe," that is to say, searching for stations does not cause any kind of interference with one's neighbours.

Having set out the advantages and claims of the circuit, let us examine any possible drawbacks so that there shall be no misunderstanding.

H.F. and Detector.

In its fundamental form, two valves are used, one a high-frequency valve and the other a detector valve. The sensitivity of the set is not claimed to be as good as is possible with a well-designed neutralised set with one stage of efficient radio frequency, properly neutralised, with a detector. Such a receiver, skilfully handled, will bring in distant stations at greater strength and, if reaction is used, results will be distinctly better in sensitiveness than my arrangement.

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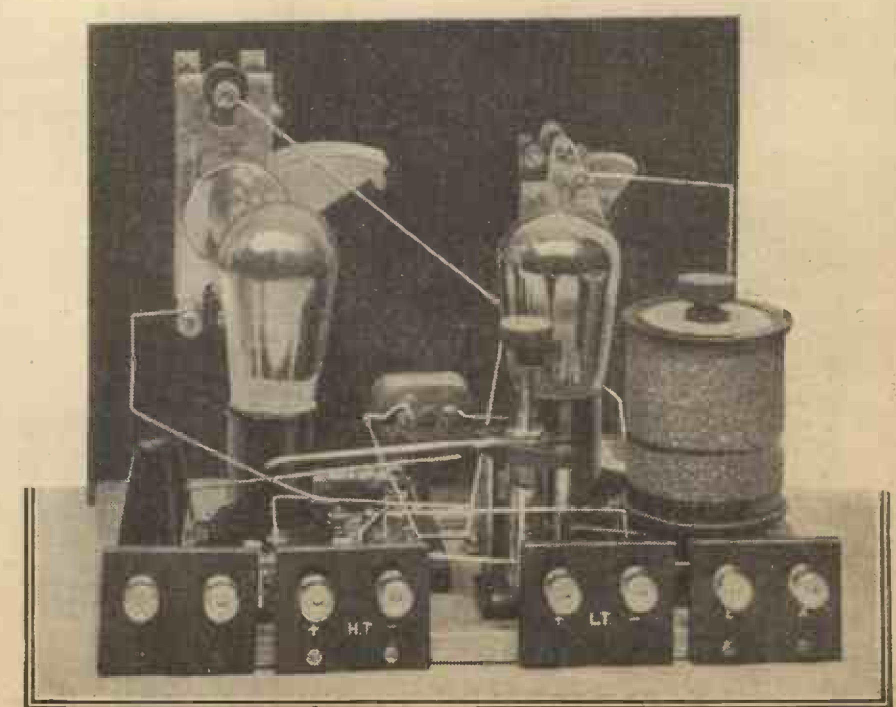
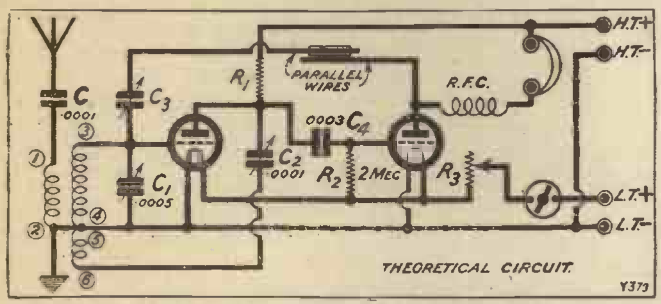


With valves and coils in position—a back view of the "Constant" Two.

THE "CONSTANT" TWO.

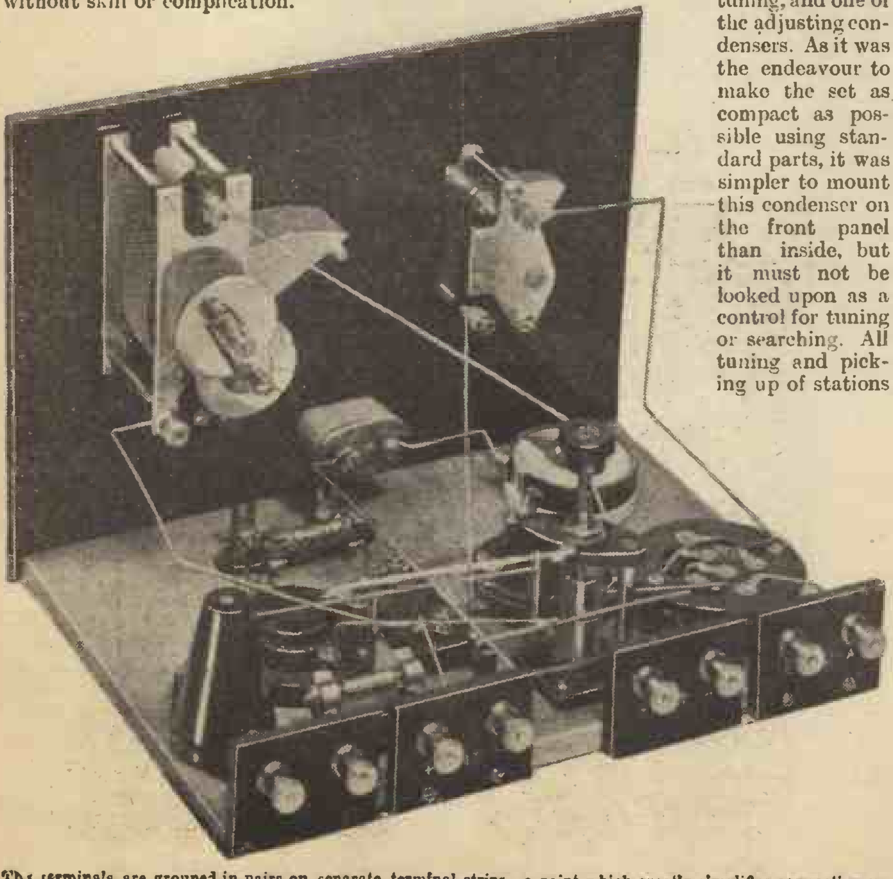
(Continued from previous page.)

At the same time the new circuit is appreciably more sensitive than a detector valve with reaction, unless this latter is pushed to the distortion limit. Thus its sensitivity falls between a single valve with reaction and a properly designed neutralised H.F. and detector set.



The theoretical circuit of the "Constant" Two. Whereas in the Loftin-White method of obtaining constant reaction the effects of inductance and capacitative coupling were balanced against each other, in Mr. Harris' system use is made of the rising efficiency of resistance-coupled H.F. stages with rise of wave-length; capacity feed-back being utilised to provide reaction.

Do not forget that this last requires two tuning controls and some little experience to neutralise it properly, while to get the best results rather skilful handling is required. As a contrast, with my circuit the preliminary adjustment is simple, and once made the beginner can obtain remarkable long-distance results not previously possible without skill or complication.



The terminals are grouped in pairs on separate terminal-strips—a point which greatly simplifies connecting-up and reduces the danger of placing the wrong battery leads on the wrong terminals.

The next points relate to the selectivity of the receiver. At a distance of twenty or thirty miles from a broadcasting station the selectivity of this set is all that anyone can require. On the other hand, when used in the immediate vicinity of a station up to six or seven miles, the selectivity is not so good as that of a properly designed and skilfully handled single-valve detector with reaction.

At six or seven miles from London this station can be heard as a background up to about 450 metres, but stations above that, such as Langenberg, 5 G B, Vienna, Munich, Brussels, can all be heard quite free from London.

Users who are working underneath the shadow of a local station would require a wave-trap, of the kind recently described by Mr. G. P. Kendall, to give a high degree of selectivity. This can be set once and for all to the local station, thus retaining the single-control feature and all the virtues mentioned above, plus all the selectivity that can be reasonably required.

Let us now examine the practical set made up with this circuit and illustrated in the photograph and drawings with this article. It consists, as will be seen, of a small cabinet with a 10 in. by 7 in. panel, carrying on the front a vernier dial for tuning, and one of the adjusting condensers. As it was the endeavour to make the set as compact as possible using standard parts, it was simpler to mount this condenser on the front panel than inside, but it must not be looked upon as a control for tuning or searching. All tuning and picking up of stations is carried out solely on the large vernier dial. Those readers who are prepared to use a larger cabinet can easily find room for this adjusting condenser inside.

The only other piece of apparatus carried by the front panel is the on-and-off switch. Looking now at the apparatus from the back, we see that the baseboard carries a standard six-pin base, two valve holders, a standard neutralising condenser (not used for neutralisation), two grid-leak clips with standard forms of grid leak, a radio-frequency choke and a grid condenser, with baseboard-mounting filament resistor to complete the list.

COMPONENTS REQUIRED.

1 Panel, 10 in. by 7 in.
1 Baseboard, 10 in. by 7 in.
Cabinet to take same.
1 Variable Condenser, ·0005 mfd., with vernier dial (J. B.). (Any good make, square law or S.L.F.)
1 ·0001 reaction condenser, variable (Cyldon). (Igranic, Peto-Scott, etc.)
1 On-and-off switch (Igranic). (L. & P., Lissen, Lotus, etc.)
2 Valve sockets (Lotus). (Ashley, Benjamin, Bowyer-Lowe, B.T.H., Burndept, Burne-Jones, Lissen, Lotus, W.B., etc.)
1 Radio-frequency choke (Burne-Jones). (Bowyer-Lowe, Efesca, Lissen, McMichael, Metro-Vick, R. I.-Varley, etc.)
2 Grid-leak holders. (Dubilier, Lissen, etc.)
1 Grid leak, 2 megohms (Lissen). (Dubilier, Igranic, Mullard, etc.)
1 Grid leak, ¼ megohm (this is used as the anode resistance) (Dubilier). (Carborundum, Igranic, Lissen, Mullard, etc.)
1 Fixed condenser, ·0003 mfd. (Lissen). (Clarke, Dubilier, Igranic, Lissen, Mullard, T.C.C., etc.)
1 Fixed condenser, ·0002 mfd. (Lissen). (Clarke, Dubilier, Igranic, Lissen, Mullard, T.C.C., etc.)
1 Baseboard-mounting filament resistance (Igranic). (Lissen, or other similar type.)
1 Standard neutralising condenser. (NOTE.—This must be of the fine adjustment type. The Jackson shown is particularly suitable for this set.)
1 Standard six-pin base (Colvern). (Bowyer-Lowe, Burne-Jones, Lewcos, Peto-Scott, etc.)
1 Standard Reinartz type of transformer.
Terminals for: Aerial, Earth, L.T.–, L.T.+, H.T.–, H.T.+, and Telephones. (These can be on one long strip or on separate pieces, as desired.)
Wire for wiring up, and a short length of Glazite, if this wire is not used for wiring the whole receiver.

NOTE.—In most cases in the above list the make of the actual component used in the set is indicated, and following this a few suitable alternatives in alphabetical order.

Aerial Series Condenser.

The theoretical diagram and the practical wiring diagram show a ·0001 mfd. condenser in series with the aerial. This was not used in the set when the latter was photographed but has since been added for reasons which will be explained a little later. It is not necessary if the receiver is required merely for the local station and

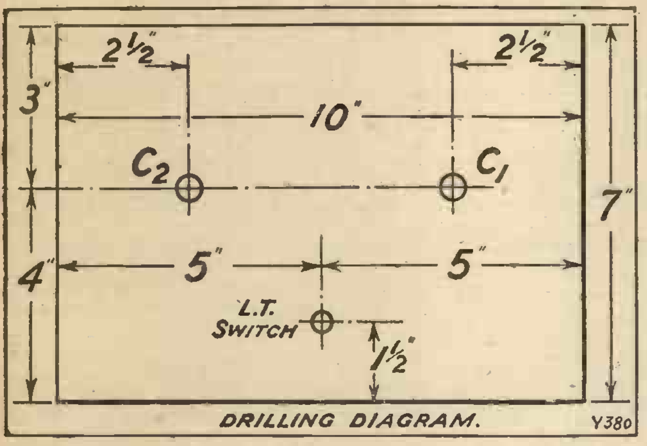
(Continued on next page.)

THE "CONSTANT" TWO.

(Continued from previous page.)

5 G B, or when the set is used with an indoor aerial (on which it proves remarkably sensitive).

The first valve is resistance coupled to the detector valve (the anode resistance consisting of a ¼-megohm grid leak), thus effecting a very considerable saving in cost. A standard six-pin Reinartz coil is adopted, and what is generally termed "Reinartz" reaction is used in the first circuit, the condenser for obtaining this being mounted on the front panel. In the plate circuit of the detector valve is a radio-frequency choke, while a very small capacity is connected between the plate of the detector valve and the grid of the high-frequency valve. This capacity must be exceedingly small—smaller, in fact, than the standard neutralising condenser, and to get such a low value an adjustable neutralising condenser is placed in series with an extremely small condenser formed of two parallel wires, insulated from one another, but otherwise kept as close as possible. The practical way of making this parallel wire condenser is shown in the illustration.



DRILLING DIAGRAM.

The lead from the plate of the detector valve and the lead from the neutralising condenser are not joined but overlap for about 2 inches One of these wires is bared and the other consists of a piece of Glazite, the insulation of which is thin but sufficient for the purpose. In the photograph the wires are shown slightly separated for clearness, but once they have been cut and fixed in position they can be gripped together with a piece of sticky tape, such as electricians use. (If you do not do this the capacity will vary with vibration.)

Balancing Results.

As explained in last week's article, the method of obtaining constant reaction is as follows. Reinartz reaction needs more and more reaction condenser in circuit as we pass from the lower to the higher wave-lengths, which means in effect that a setting of the Reinartz reaction condenser which will bring the set just to the point of oscillation at, say, ten degrees on the tuning condenser scale, is much too small when the same condenser is set for, say, 100 degrees. On the other hand, the reaction from the plate of the detector valve to the grid of the high-frequency valve, if giving such a state of sensitivity at 100 degrees on the scale, will be too weak at 10 degrees on the scale.

The reason for this is that the resistance capacity is less efficient as we pass from the high to the lower wave-lengths. By making adjustments of the two reaction values (the Reinartz on the high-frequency valve, and the capacity reaction from the plate of the detector valve) we can balance these effects and get a constant reaction adjustment which will "stay put" over the whole scale of the tuning condenser.

Constructional work is very simple, but the actual lay-out of parts shown should be closely followed.

The Valves.

The first valve *must* be a resistance-capacity valve, and the second a valve of a magnification factor of about 15 to 25 and an impedance round about 15,000 to 25,000 ohms. You have a wide choice of makes, but it is essential that the types should be as indicated, the detector valve being what is generally termed a "high-frequency" valve. Most makers plainly label their valves "R.C." or "H.F.", but, unfortunately, the Marconi and Osram firms have labelled some of their new valves in rather a misleading fashion For example, the D.E.H. is really an "R.C." valve, although the H would rather suggest it is an ordinary high-frequency valve of medium impedance, while the D.E.L. is much nearer the high-frequency type of valve than the low-frequency, the impedance being 13,000 ohms and the amplification factor 15 (in the 6-volt series). Incidentally, a D.E.H. and a D.E.L. make a very good combination for this set, as do a P.M.5B, and a P.M.5X, Cossor R.C.610 and H.F.610, and Six-Sixty types 610R.C. and 610H.F. The same makes of 4- and 2-volt valves also work very well.

Setting the Reaction.

Preliminary adjustments are very simple to make, and far easier than the usual process of neutralising a high-frequency circuit. The first step is to connect up the batteries and telephones, but to leave the aerial and earth terminals free. Set the neutralising condenser on the baseboard at its minimum position and the Reinartz condenser on the front panel, also at its minimum. Choose an H.T. voltage of 90 to 120 (it is not very critical). Now swing the tuning condenser backwards and forwards, listening carefully in the telephones for signs of oscillation.

This set goes into oscillation so smoothly and quietly, that unless you are careful you may not notice whether it is oscillating or not. The simplest way to find out is to wet the finger and touch the fixed plates terminal of the tuning condenser. When the set is oscillating you will hear a "plop" when you touch the terminal, as well as when you withdraw your finger. When it is not oscillating you will hear very little sound, if any.

If the set is not oscillating (it should not be at this stage) screw the neutralising condenser down a few turns and swing the condenser backwards and forwards again. You will soon find a position by adjusting this where the set will oscillate freely at the

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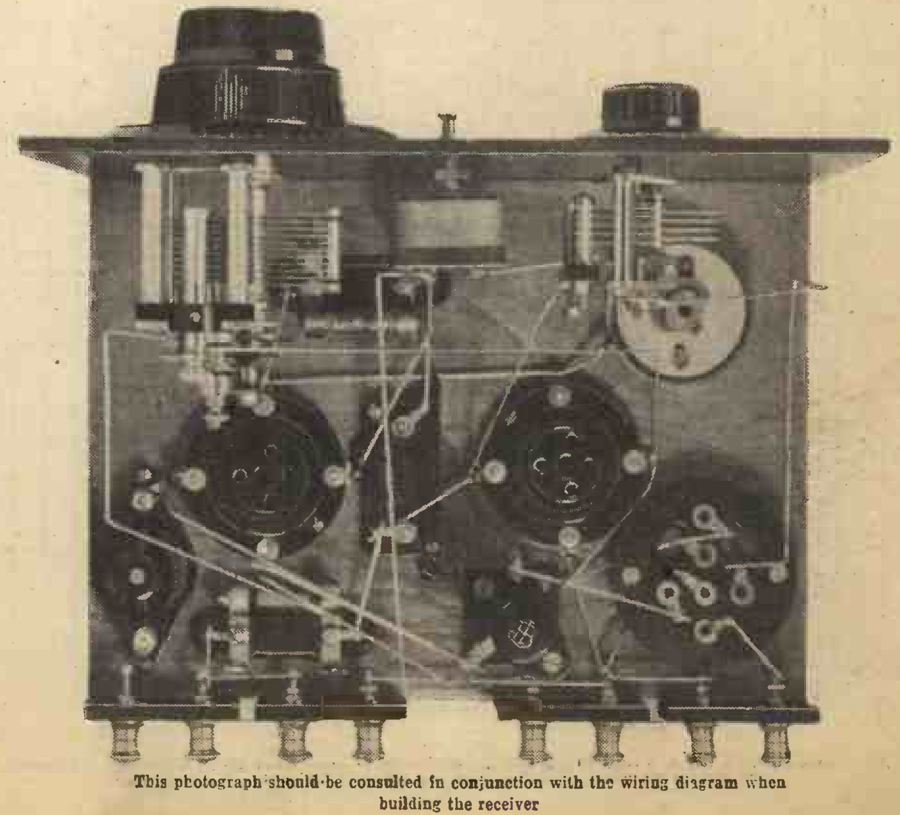


This photograph should be consulted in conjunction with the wiring diagram when building the receiver

THE "CONSTANT" TWO.

(Continued from previous page.)

top of the scale but not at all at the bottom. When this state is reached, turn your attention to the Reinartz condenser.

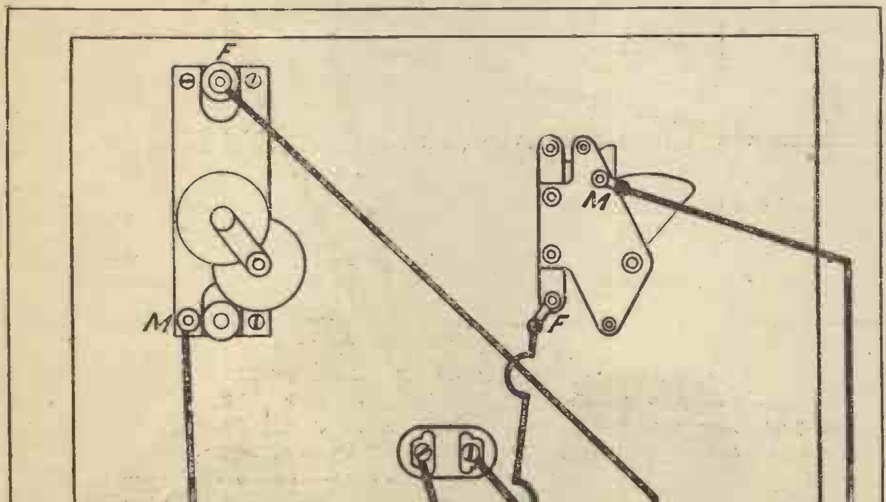
Now if you turn the Reinartz condenser you will find that this will make the set oscillate still more freely, but here the tendency will be to oscillate more freely at the bottom of the scale than at the top. Aim for a combination of the two condensers where the set is oscillating freely over the whole range, and then reduce one or the other, or both, until the set is just below oscillation point the whole scale. If all is well, the set will oscillate practically uniformly over the whole scale from top to bottom, and by decreasing the reaction control you will come to a condition where the set is just below oscillation point over the whole scale. Actually, there will be a slightly reduced tendency to oscillate in the middle of the scale, but this is scarcely noticeable.

Making sure that the set is not oscillating at any point, connect aerial and earth. You will now find the set is surprisingly sensitive, and you can turn the dial backwards and forwards and pick up a number of stations. There is no need to make further adjustments of the reaction condensers for general work.

An Interesting Feature.

Now we come to a very interesting point in regard to this, and, in fact, all "constant-reaction" receivers.

Any aerial which will receive will also radiate, and for a given aerial the efficiency of radiation will increase as we decrease the wave-length. This means that an aerial connected to a set such as this will absorb more energy from the set at the bottom of the condenser than it will at the top, and this means that when the aerial is connected and the adjustments left as they are, the set will be in a slightly less sensitive condition towards the bottom end of the condenser than at the top. In many cases, however, the sensitivity of the set will be quite sufficient without the insertion of a series condenser, but a more uniform sensitivity is obtainable by inserting a ·0001 or ·0002 mfd. condenser in series.



Aerials differ so considerably that a set itself cannot be made automatically to adjust itself without trial to every aerial, and so, having designed a set which in itself gives constant reaction over the tuning scale, I must leave it to the reader to fit it to his own aerial conditions. In some cases no series condenser will be needed, but in others it will be. If the set is found to be sufficiently sensitive over the whole scale with your aerial, join the wire going from the aerial terminal of the set to terminal one on the six-pin base. If your aerial is such that the set is less sensitive at the bottom of the scale than at the top, then wire the set as shown in the practical wiring diagram.

If you are very close to a station then a simple wave-trap will give you all the selectivity you need.

This set is particularly suitable for giving good strong telephone signals (on several pairs of 'phones) from the local station and 5 G B, using a very poor indoor aerial, such as a wire round the picture-rail. A change to the alternative programme, that is from the local to 5 G B or vice versa, is made in a second by turning the tuning dial from one point to another. Once you have found the tuning positions for these two stations they will always remain the same, providing you do not change your aerial, or the make of valves.

On the Long Waves.

It is rather interesting that the method of reaction on this set remains just as good on the Daventry range, while the efficiency of the high-frequency side is, of course, higher, owing to the greater efficiency of resistance coupling on the longer waves. However, the set is very unselective on this range, and it is not possible to separate Radio-Paris from Daventry on an average aerial. Nevertheless, for Daventry alone it is exceedingly sensitive.

Of course, a readjustment must be made of the two reaction condensers, less of the neutralising condenser being required on the Daventry range than on the ordinary broadcast band. If at the minimum position on the neutralising condenser the set is still found to oscillate a reduction of the high-tension voltage will overcome the difficulty.

In general the set works very well indeed on a 100-volt H.T. battery, which need not be of large size, as the consumption of the set is quite low For example, with an old H.T. battery of 100 volts, giving actually 93 volts, the H.T. consumption was only 2 milliamperes, at which figure no one can grumble.

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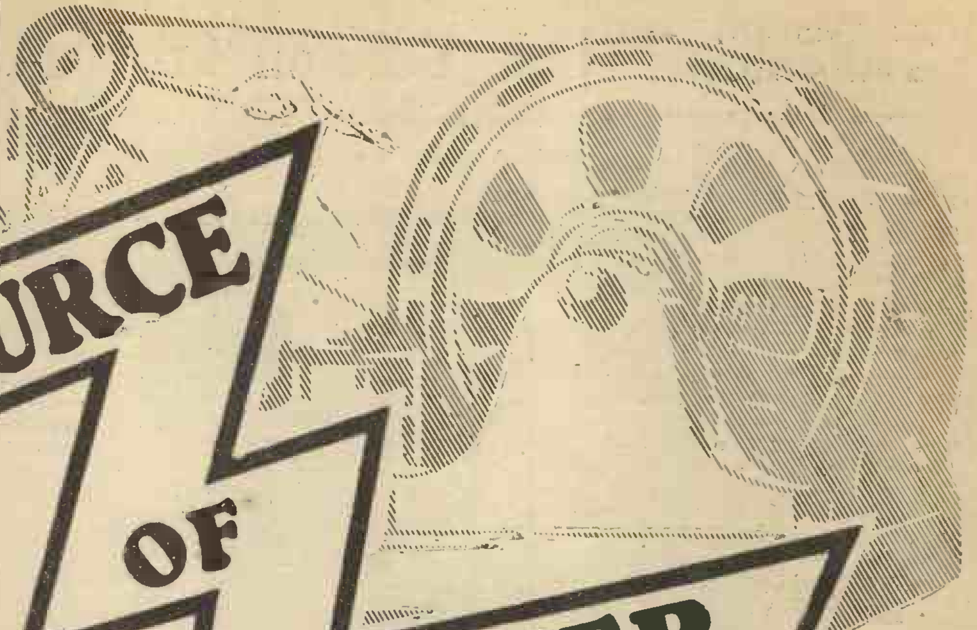

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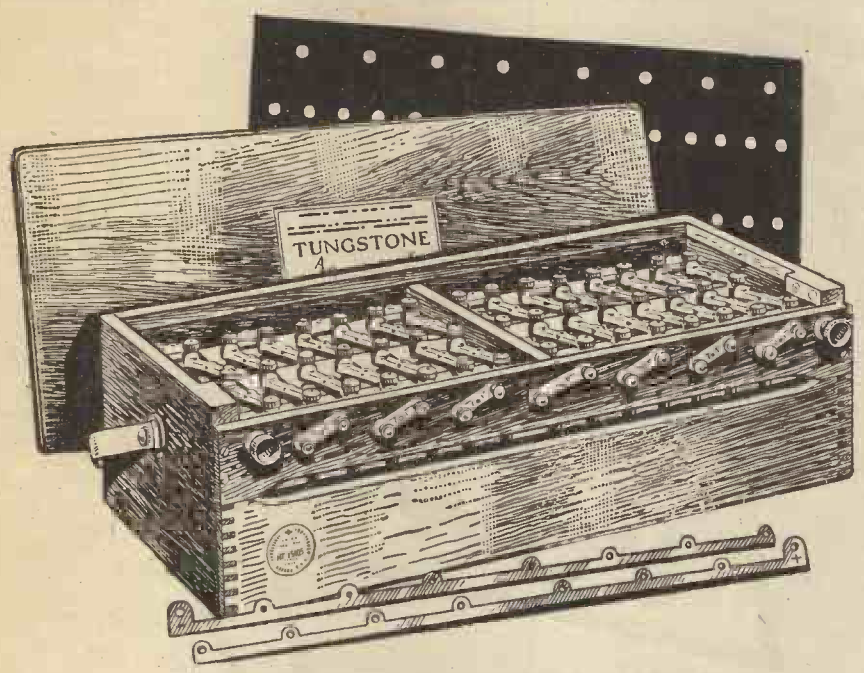

Showing Low Tension Charging Equipment removed.

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WIRELESS AND HUMANITY

A CHRISTMAS ARTICLE

by SIR OLIVER LODGE

A Christmas "P.W." number without an article by its Scientific Adviser would not be a real Christmas number. But Sir Oliver is always obliging—and when we invited him to contribute to this special issue, he wrote the following article specially for "P.W." readers. He has chosen a theme which is very suitable for a Christmas number, and readers will, we know, read his article with considerable interest.

THE EDITOR.

THE new powers available for easy communication between scattered people has developed a great feeling of co-operation and friendliness throughout the country. Broadcasting is a privilege which everyone can enjoy, both the transmitters and the receivers. Never before has anyone been able to address personally so large an audience, and never before has it been possible to receive instruction and entertainment with so little effort.

Importance of the Mind.

People sometimes say that the brain of man has achieved wonderful things; but to my mind, in saying that, they are crediting the brain with more than its due. The brain is only the instrument or organ of mind; it is very like a transmitting and receiving instrument; but it originates nothing of the messages sent, nor does it understand the messages received. We do not really see with the brain, or with the eye, but with the mind. Similarly, the ear "hears" no more than does the telephone; it is a receiving instrument which stimulates cells of the brain, so that in some mysterious way the mind is able to interpret the message. All that we emit when we speak are vibrations of the air, which are then by skilful operators transmuted into etheric vibrations. How is it that those vibrations, whether etheric or aerial, are able to convey ideas and transmit thoughts from one person to another is still a mystery, and it is well for us to remember that the mind is dominant over all, and that without it the whole operations would be meaningless.

Much to be Done.

At this Christmas season, moreover, our attention is directed to things of still higher importance than even the intelligence. The needs of humanity are brought to our notice, and there is a spirit of willingness to help, so that family affection overflows into a love for mankind in general, pity for the distressed, and relief of suffering so far as comes within our power. Humanity is becoming welded more and more into one family.

Calamities have always occurred, but not till now has knowledge of them been so universal, and gradually the idea of purposely inflicting pain and suffering and bereavement, which appears to be the only object really achieved by war, will become unthinkable.

The results of scientific research have made travelling all over the world easy, and increased the facility for intercommunion. Civilisation is far from complete at present. There is still much to be done.

Fortunately, many are realising that things are not managed nearly so well as they might be, and there is no lack of instructors. One difficulty no doubt is to recognise which of the suggested remedies are wise and which unwise; but the main difficulty is not in the choice, but in the lack of energy to try experiments. We can often only tell what will answer by trying it; and there are many things already discovered which are waiting to be put into action. Biologists are teaching us how to overcome disease, partly by strengthening our own powers of resistance, and partly by competing against the pests and parasites by introducing and utilising their natural foes.

Mutual Co-operation.

In new countries this process has already been begun on a large scale; but the same principle can be applied in less obvious ways.

Agriculturists are studying how to increase the fertility of soils, and how to breed more favourable and more disease-resisting varieties. Biologists are teaching us how man can control the influx of life in its association with matter, so as to regulate it for the benefit of the higher organisms.

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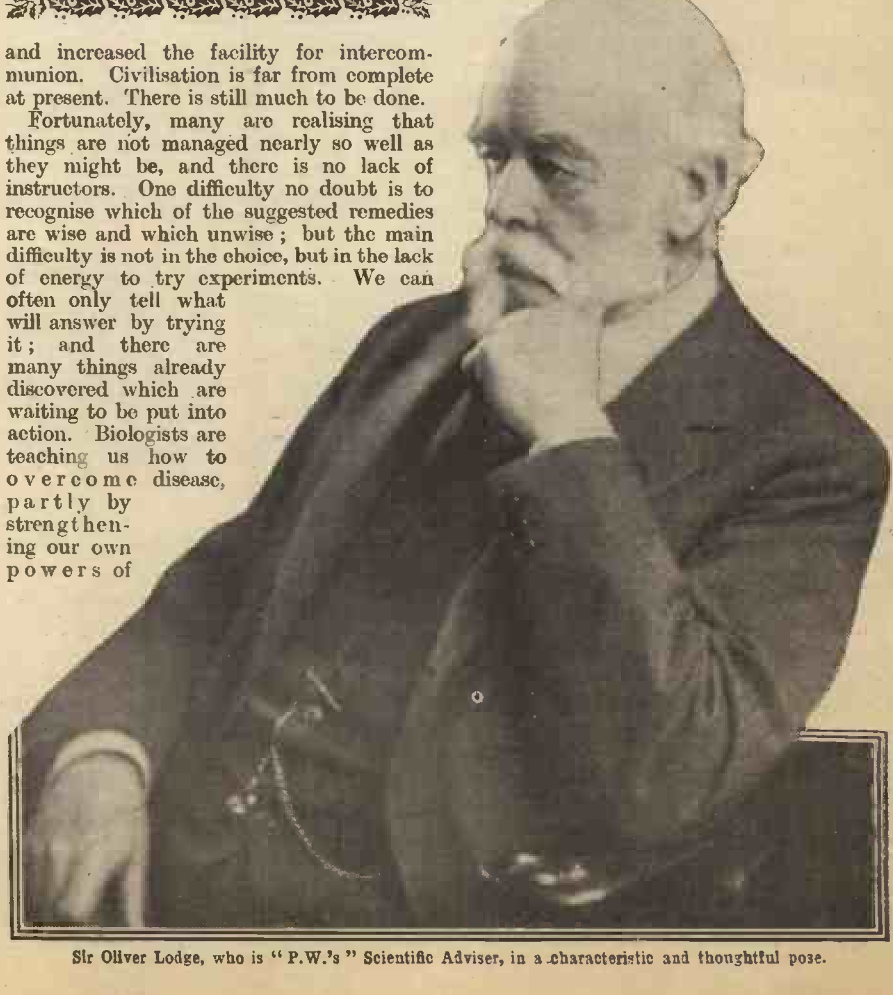

Sir Oliver Lodge, who is "P.W.'s" Scientific Adviser, in a characteristic and thoughtful pose.

WIRELESS AND HUMANITY.

(Continued from previous page.)

They have also taught us many instructive things about symbiosis, or the art of living together—the mutual co-operation which is so prominent between animal and vegetable, and between the members of a family; flourishing life is dependent on the help and assistance which one organism can, often quite unconsciously, give another. This principle of symbiosis can be applied to humanity, for the prosperity of any one nation is closely connected with the prosperity of the whole: we do not really prosper at the expense of our fellows. Poverty and disease in any one part of the world is a danger to all the rest. We are beginning to learn that we are members one of another, that we have a corporate existence, that damage to any one part is felt by the whole, and that hostile attack by one part on another is suicidal.

"The More We Are Together. . . ."

The progress of physics has made us realise how small a unit the world is, and is beginning to make social intercourse possible all over its surface. There is a song which says, "The more we are together the happier we shall be," and whether we call it symbiosis or something else, that is a pregnant truth for the different units of humanity.

The extension of the means of communication, so familiar and conspicuous at the present time, has been due to the utilisation of something else than matter. We do not live by matter alone. Children kept in merely material surroundings develop rickets and many other diseases. We are associated not with matter only, but with ether also; and it is through the ether that radio-telegraphy occurs. The ether is a comparatively recent discovery, and we little know what its powers are.

All our energy reaches us from the sun in the form of ether vibrations, and we have begun to find out that these ether vibrations are essential to health. The applications of ultra-violet light are but beginning. We have indeed only recently begun to use electricity; we use it now for lighting and locomotion and the transmission of power. But who would have thought, thirty years ago, that we should be enabled by its aid to see inside opaque bodies, and to speak, and perhaps soon to see, round the world? We are not working with matter alone, but with ether also, though only recently have we begun to do so consciously, and there is much more to be done.

Great Possibilities.

Humanity as a whole is still very ignorant and does not realise the possibilities ahead. No one can predict them with any certainty. We can only see what has been done in the past, and try to apply our knowledge with more wisdom and less mistakes in the future. Our association with matter has produced a whole crop of problems which we have not known how to tackle. Not by attending to matter alone shall we be able to deal with them wisely. The universe contains so vastly much more than matter. Most of our mistakes are due to a too exclusive attention to it. We have been told this, time and again, by seers and poets and prophets.

We are beginning to realise, even in science, the importance of our etheric environment, and how much can be done by harnessing the dominating forces of electricity and magnetism and light; which, though physical, are not material. And so we shall go on to realise that above and beyond these are mental and spiritual realities, to most of which our temporary absorption in matter has made us blind.

The destiny of humanity, whether as an individual or as a race, is something far higher than at present we can apprehend. The universe is a far bigger thing than we as yet realise. Its material aspect is only one of many. Our present embodiment has been reached through æons of gradual evolution and development, and we can only dimly speculate on what we shall become in the long future ahead.

This "bird's-eye" view of Paris was taken from the top of the Eiffel Tower. The strings of insulators which can be seen are only a few of the total used for the great radio aerial.

TECHNICAL NOTES. By Dr. J. H. T. ROBERTS, F.Inst.P.

A RADIO DETECTOR.

An Underground Aerial—Vertical Container Type, etc., etc.

If you were given the following list of components, how many different circuits could you make? A contest on these lines formed part of the proceedings at a recent gathering of the American Radio Relay League, and was the source of a great deal of entertainment. Each competitor was given a sheet of paper with the following instructions:

Draw as many circuit diagrams as possible from the apparatus listed below. No single piece of apparatus may be used more than once in any one circuit, but any one piece of apparatus may be used in any number of different circuits. Each diagram must be in working condition and must be labelled:

One earth, one aerial, three receiving valves, three filament rheostats, one 6-volt battery, one pair of headphones, one H.T. battery tapped to 90 volts, two variable condensers (·0005), four air-core receiving coils, two low-frequency transformers, two valve holders, two high-frequency chokes, one grid leak and condenser.

An Underground Aerial.

Underground aerials have not as yet achieved very much popularity in this country, although in the States a considerable percentage of sets employ aerials of this kind. One of the best-known commercial underground aerials is that which goes by the trade name of "Sub-Antenna." This consists of a length of lead-sheathed cable, loaded at intervals, and completely sealed up at the end remote from the wireless set. This type of antenna is laid in a trench, about 4 ft. square and about 3 ft. deep, in a series of three or four flat layers, rising successively by intervals of about 12 in., the whole of the trench being then filled in with earth.

Vertical Container Type.

A new type of underground aerial has now made its appearance, in which a vertical metal container is used, within which is a vertical coil of wire. A hole is sunk in the ground, about 2 ft. deep and about 12 in. in diameter, and the container is simply dropped into the hole and the latter filled up with loose earth to which plenty of water is added. The container is similar, both in size and shape, to the conical type of fire extinguisher with which you are probably familiar. A rubber-covered wire leads from the antenna to the earth-terminal of the set in the usual way.

It is claimed for this aerial—which goes by the name of "Aer-O-Liminator"—that

(*Continued on page 820.*)

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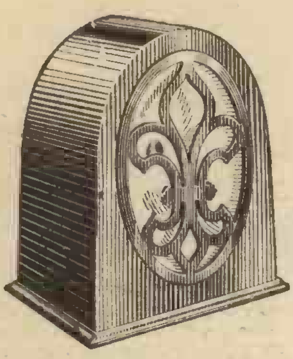

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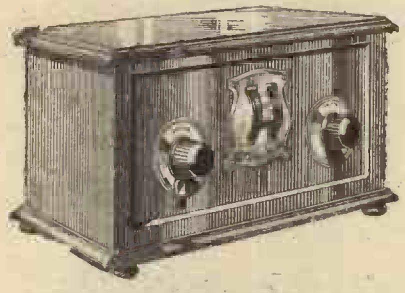

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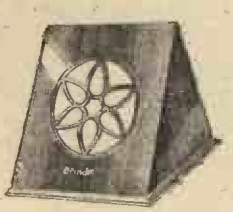

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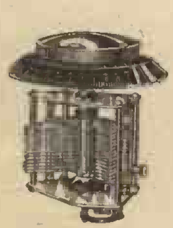

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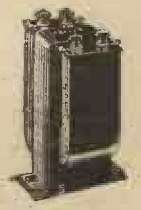

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Extract from test report in the "Broadcaster," Wireless Trade Paper, dated July, 1926.

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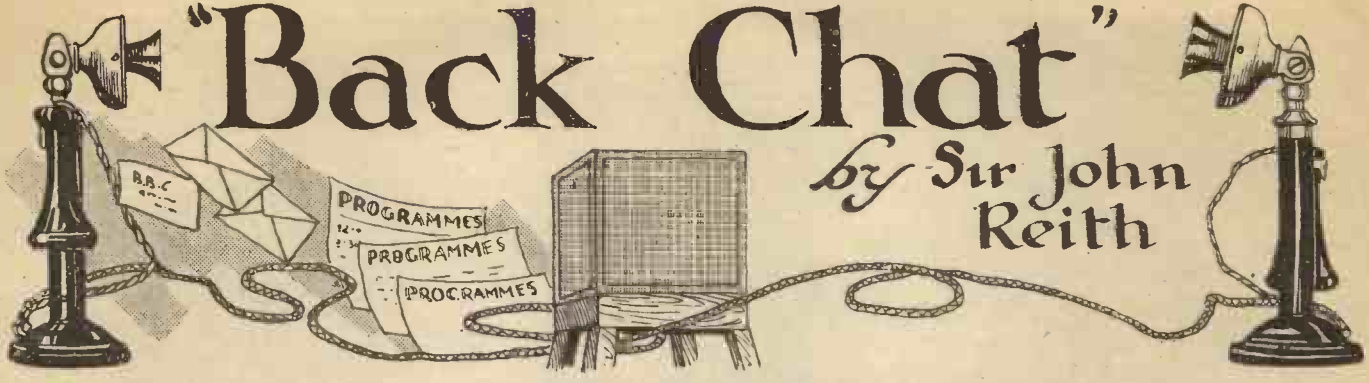
"Back Chat"

by Sir John Reith



At an hour when most decent self-respecting offices are well and thoroughly closed up for the night, the cat put out, and the watchman fast asleep, my telephone rang.

Now there are telephone rings and telephone rings. In my office I can fairly accurately judge the importance of the call by the nature, volume, and persistence of the ring. Our telephone exchange is intelligent, very intelligent, but even their judgment in this matter is sometimes at fault; they invariably, for instance, give what might be termed a Class A ring for my wife on the rare occasions when she calls me up at the office, but, of course, they cannot be expected to "jalouse," to use a good Scotch word, that it is nothing more urgent than an enquiry as to just *how* late one is going to be for dinner.

By differentiation between telephone calls I do not mean to suggest that the summons of anyone "below the salt"—say, Class C or D—is ignored or even postponed without due or adequate cause. I am only suggesting that when one is already talking on another line or engaged in some really momentous conversation, or signing cheques which are urgently required (as most cheques seem to be), an unassuming, tentative ring can probably be left to itself without inviting catastrophe of one kind or another.

The Telephone Call.

To revert back to this particular call last Friday, if it was not a Class A ring it was very near it. It might, in fact, be described as Class 2A plus. At any rate, I answered it pretty quickly. None the less one was a little annoyed. It was, so to speak, past office bedtime.

"Yes," I said—just like that—irritable like, you know.

And the voice replied:

"This is the Talks Director of the British Broadcasting Corporation."

This was rather astonishing. Unusual carelessness on the part of the telephone exchange. A call for some unfortunate celebrity being inveigled into giving a talk for us. Telephone connections gone adrift.

"The Talks Director of the B.B.C. speaking," repeated the voice.

"Oh, is it," I said. "Well, this is the *Director-General* of the B.B.C." (And I nearly added "Huff you.")

"Wait, wait," said the voice hurriedly, with some agitation, the owner of the voice being apparently apprehensive of a cut-off.

Naturally, when one member of the staff addresses another by means of his official title, in an agitated tone of voice, one, so to speak, fears the worst (or sometimes the best—a resignation, for example, or at any rate, a crisis). And we *enjoy* crises here.

When we received the following article from the Director-General of the B.B.C. it had no title; but we think that our readers will agree that this is one of the most entertaining articles Sir John Reith has ever written. The title we have chosen for it is, perhaps, rather colloquial—but we take full responsibility!—THE EDITOR.

"Well," I said.

"I am speaking to you on the instructions of the Programme Board. They have decided that you shall give a talk at 9.10 next Monday night."

"Oh, they have, have they?" I said. "They had better think again. It is not the first time they have done a stupid thing, anyhow."

"But they have really, and they insist on your doing it. You really *ought* to do it."

"Very well, for purposes of argument even at this late hour of the day (although any further dallying with affairs of state will inevitably cause complete ruin to our respective dinners and, incidentally, still further imperil domestic harmony) let us investigate the subject. What *ought* I to talk about?"

Sir John Reith.

"Some sort of official message from the B.B.C., or a pronouncement of policy, or something of that sort."

"And who do they think would be interested in that? Do you mean the kind of thing that begins very solemnly and portentously and ends up with 'The Radio Times' on sale on every bookstall, or the libretto of 'Rigoletto'?"

The reply was inconclusive.

"What do the Programme Board in their omniscience and omnipotence propose I should speak about, anyway?"

Embarrassment at the other end of the telephone line was marked. The Programme Board had apparently made their sapient decision and left it at that. No effort, you will observe, to sketch out main points for me. Nothing at all. Just "9.10: Director-General. Put it down. Let him know about it," and left at that.

"What *do* they suggest?"

Obviously they had suggested nothing.

But the Talks Director was gradually recovering equilibrium and balance.

"Tell them the number of programme hours we have to fill per annum."

"I think they know that already" I replied. "How many are there, anyhow?"

"66,000 per year; 5,500 per month; 1,270 per week; 181 per day, approximately."

"Really!" I said. "Thank you. And then I suppose you were going to suggest my giving the breakdowns worked out to the third place of decimals. I know that one, ·07 per cent."

"Quite," replied the Talks Director. "Then about having to plan programmes so long ahead."

Some Suggestions.

"Yes, months and months; and every detail fixed *at least* six weeks ahead. 9.36 p.m.: Songs of Araby from the Studio. 10.4 p.m.: Songs of Araby from Eastbourne. Very clever work that; takes a lot of doing to avoid having two people singing the same song at the same moment in the same studio, or even *more* to avoid having two people singing a different song at the same moment in the same studio. Then, perhaps, I might tell them about the number of alterations, cancellations, and expurgations in the programmes at the last moment."

But that idea was apparently not acceptable to the Talks Director.

"We have to do clear thinking," the Talks Director went on, "often dealing with very delicate matters in an atmosphere of incessant telephone calls, red lights, and other signals of alarm."

"Alarms? Who from?" I interposed.

"They have to perform complicated jigsaw puzzles, wonderful feats of dovetailing one station with another, reconciling the various claimants to programme time——"

"Well, anyhow," I interjected. "*I* am not a claimant on programme time. May I go now?"

". . . provide alternative programmes on various wave-lengths, cover fields as various as religious services and dance music, education and variety, chamber music and children's fairy talks, church organs and mouth organs . . ."

"The mouth organ got past me," I said. "When was that on?"

". . . and satisfy differing tastes of

(Continued on next page.)

"BACK CHAT"

(Continued from previous page.)

twelve million listeners, scattered over an area from Land's End to John O' Groats, and from Cromer to Londonderry . . ."

"*I* know, California to Maine, from the Gulf to the Great Lakes. Greenlands icy mountains . . ."

"... On this task are employed hundreds of engineers, programme staff, editors, and publishers, accountants, Station Directors, announcers, writers, conductors of music, musicians, administrators . . ."

"Yes, yes, 'the rich man in his castle, the poor man at his gate.' Further, why not a Director-General here and there ?"

". . . the artistic temperament has to work side by side with the business man, the idealist has to learn to be practical, and the technician not to despise the dreamer of dreams . . ."

Properly "Het Up"!

"Half a minute," I said, "half a minute. Repeat that last bit. I broke my pencil. You should give warning of a shock like that."

"The artistic temperament has to work side by side with the business man, the idealist has to learn to be practical, and the technician not to despise the dreamer of dreams."

"Sorry to interrupt you so often, but who is the dreamer of dreams, and what time of day is he dreaming ? Office hours 9.30 to 6, and then some."

The Talks Director was, as one might say, properly "het up," and a halt had to be called sometime. The labourer is worthy of his hire—and his dinner.

"What about adjourning this till to-morrow? Growing indignation in the kitchen, and so on . . ." "Well," I said, "there is nothing new in all this, and it does not sound particularly interesting. Have you any *more* ideas ? How about, for instance, giving the public what they want ?"

"No," said the Talks Director, "I do not think I would refer to that. But what about telling them why we do a certain amount of modern music ?"

"Yes," I agreed, "that might be a good point. Why do we ? I have often wondered."

Very Interesting!

But the Talks Director felt that that question should be addressed to another colleague.

"Of course one of the most interesting events that has happened in the last twelve months has been the change in constitution of the B.B.C."

"Oh yes ? What about that ?"

"Some listeners have professed to detect in the programmes a change of spirit which they attribute to what they call 'Government control.' Tell them they are quite wrong, of course. Not only has there been no increase of Government control, perceptible or imperceptible, but there has been no change in the spirit or personnel. There may be some signs of our growing up, or settling down."

"Yes. About time, too, wasn't it ?"

"And a great point," the Talks Director went on, "is the exercise of imagination, always searching for new ideas, carrying out experiments, investigating new lines of programme development . . ."

"Yes," I said hastily.

". . . but even if there is a vast administrative machine, the B.B.C. will never settle down into anything like the humdrum operations of a machine, working by a routine . . ."

"Festooned with red tape," I suggested.

My interruption was ignored.

"The strange instrument, the microphone, into which you will speak contains in itself an element of wonder and mystery. In all our work there is that sense of voices and harmonies cast into the void, echoing back in high welcome from all over the earth."

("Boomerang," I thought.)

"What was that bit about 'high welcome'?" I asked. "I suppose you are thinking of the Programme Correspondence Section—ten thousand letters per week—especially after some particularly bright effort of the Programme Board's has fallen flat."

Then came a *real* Class A ring on the other telephone.

"I must go now," I said to the Talks Director. "I have so much enjoyed our little chat. Good-night to you, good-night."

A dangerous task ; a workman painting the aerial mast at Langenberg, the great German broadcasting station.

BROADCAST NOTES

FROM OUR BROADCASTING CORRESPONDENTS

Christmas Programmes—A Nativity Play Again—"Rigoletto"—"Hansel and Gretel"—The Radio Christmas Party—Bach's Oratorio—Bank Holiday Features—Sir Harry Lauder—Charlot and the B.B.C.

Christmas Programmes.

CHRISTMAS DAY, falling this year on Sunday, necessitates careful treatment of the Yuletide broadcasts. The programme builders at Savoy Hill have overcome their difficulties by arranging a whole fortnight of special transmissions, and these will cover both Christmas and the New Year. The most ardent Sabbatarian will have no cause to complain that Christmas Day itself will see any departure from the rigid observance of B.B.C. convention. At the same time those who like laughter and frivolity will find it in plenty both before and after Christmas Day.

Let us take a peep behind the scenes at what is being done by those who are preparing the wireless fare we are to have between December 18th and the last day of 1927.

First we see a symphony concert on Sunday afternoon, December 18th, conducted by John Barbirolli and a recital by Pouishnoff. Mr. Victor Hely Hutchinson, a member of the B.B.C. staff, who won the Carnegie Award this year for his orchestral suite of variations, has written a special work which will be given its first performance during this concert. It is a Christmas Symphony based on some well-known seasonal tunes. The evening concert will be relayed from the Grand Hotel, Eastbourne. where Sandler can be relied upon to put on a programme up to his usual high standard.

Monday, December 19th, will remind some of us of the passing of time when we hear the end-of-term concert by the boys of Shrewsbury School. Later we shall hear some variety turns and a play entitled "The Ship," the latter being performed in the Manchester Studio.

A Nativity Play Again.

Do you remember that beautiful Nativity play performed just before last Christmas by village children at Marazion in Cornwall. It was written by the Vicar, the Rev. Bernard Walke, and was performed as an act of devotion, and not in any way adapted for broadcasting. Arrangements have been made to repeat it again this year and listeners will hear it on Tuesday, December 20th. Mr. Filson Young will probably make some explanatory remarks so that we can better appreciate the efforts of the performers.

"Rigoletto."

Verdi's opera, "Rigoletto," occupies most of the programme on Wednesday, December 21st, and many listeners will sit up on this night to hear A. J. Alan tell a new story. It is called "The Visitors' Book." On the following evening we are to hear a Carillon of Carols, relayed from "somewhere in London," to perform which, I understand, a well-known carilloner is coming over specially from the Continent.

"Hansel and Gretel."

Friday brings us to a performance of Humperdinck's fairy opera, "Hansel and Gretel," without which the Christmas

(*Continued on page 816.*)

FIVE WIRELESS CHRISTMASES

by The Duke of Sutherland

The following article has been written specially for our Christmas Number. The Duke of Sutherland is President of the Radio Association, and has always evinced a keen interest in the development of broadcasting in this country.

I AM often astonished at the large number of references to wireless among writers of older days who can have known nothing personally of the greatest innovation of the twentieth century.

For example, I can picture Robert Burns switching on his set at an evening hour when he is already a little uncertain of the exact time, and musing:

> "Perhaps it may turn out a sang,
> Perhaps turn out a sermon."

Sir Walter Scott, too, wrote the perfect final message for our evening announcer when he penned the words:

> "To all, to each, a fair good-night,
> And pleasing dreams, and slumbers light!"

And it has long been clear to the wireless enthusiast that Ariel in Shakespeare's *Tempest* was (as his name implies) the personification of future radio discovery. We all know how Prospero spoke to the other characters in the play through this invisible messenger. "This is the tune of our catch, played by the picture of Nobody," says the awestruck Trinculo after one of these broadcasts.

Shades of Christmas.

Dickens, however, is the writer who is most apt to my present subject. It would be easy to adapt his *Christmas Carol* to describe the progress of popular wireless during the last five years. Just as there rose up before Scrooge the ghosts of Christmas Past, Christmas Present, and Christmas Future, so we may raise up the spectres of Christmas Wireless Past, Christmas Wireless Present and, with more difficulty, Christmas Wireless Future.

HIS GRACE THE DUKE OF SUTHERLAND.

First, then, the Shade of Christmas, 1922.

It was in this year that popular broadcasting became an accomplished fact. Tens of thousands of people listened-in that Christmas who had never done so before and who, a Christmas earlier, had never dreamed of the possibility. It was in 1922 that the London, Daventry, Birmingham, Manchester and Newcastle stations were opened and seventeen millions of people brought into potential contact with broadcasting.

The Shade of Christmas, 1923, reveals three more stations—Aberdeen, Sheffield and Bournemouth—and five million more prospective listeners. Dickens would show us the father of the family switching on his receiving set and the delight of all members of the Christmas Party, especially Tiny Tim.

Work of Amateurs.

Not to raise too many of these Christmas ghosts, let us, however, summon the Shade of Christmas Present. It shows us more than twenty broadcasting stations in the British Isles, more than twelve million listeners. Dickens would be astonished at these figures, for in his day, a hundred years ago, the whole population of Great Britain was only sixteen millions.

I should like to summon the Shade of Christmas Future—say, 1930—but I do not think there is anyone, however enthusiastic, who feels competent to foresee the pitch of development at which wireless may arrive in the next few years. Christmas Wireless Future undoubtedly holds the promise of television, but no one knows which year will add this marvel to the household.

It is true of all great lines of scientific development that the greatest discoveries have been made almost by accident, although in the course of careful and instructed research. The wireless of to-day owes very much to the work of amateurs, and it is possible that in their ranks may be the men who will make the most remarkable discoveries of the future.

As President of the Radio Association, I sincerely hope that all researches in this country will go forward with the aim of it enlarging and quickening the vision (and the television) of Christmas Future, so that, in this as in so many other directions, we, Dickens' countrymen, may lead the world.

Sutherland

A SPECIAL CHRISTMAS WEEK NUMBER

of Popular Wireless will be on sale week-ending December 24th. This will contain technical articles of an appropriate and interesting nature and, will be certain to meet with a heavy demand.

PLACE A REGULAR ORDER FOR POPULAR WIRELESS NOW

An Empir Xmas Part

The idea of an Empire Radio Christmas Party has been much below we publish some of the views of some eminent people on this i development of short-wave wireless.—THE EDIT

MR. RAMSAY MACDONALD

From the Rt. Hon. J. Ramsay Macdonald, P.C., M.P.

I watch with keen interest the development of opportunities for Empire Broadcasting. What a fine thing it would be this Christmas if the firesides of the Empire were united in one family community by wireless . . . if we could hear each other's songs and stories and mirth. What a joy it would be to those of us in the old country who have friends and relatives in the Dominions if we could know that they were dancing on those far remote floors to the same band that stirs even the most unskilled of us Londoners to tread a measure!

Five years ago the bare possibility of holding such a radio party would have seemed ridiculous; to-day it is all but an accomplished fact. Perhaps by this time next year such a party will have been arranged. Closer relationships between us and our far-flung Dominions are coming sure as the Springtime, and the bonds of human sympathy and friendship that bind this wayward earth together will then be enormously strengthened.

* * *

From Lord Danesfort, President of the British Empire Union.

As President of the British Empire Union, I rejoice to hear of the extension of broadcasting to and from Britain and her Dominions. It is at Christmas-time that we most desire of the presence of those who have gone out to Canada, Australia, New Zealand and other parts of the Empire, and I know of no better means than broadcasting by which we can bridge the gulf that lies between us. What London lad on those shores would not welcome the sound of St. Paul's bells ringing out glad tidings of Christmas Day and the voices of carol singers here chanting those old, familiar songs?

LORD DANESFORT

What boundless possibilities Empire broadcasting open up for us hardly anyone can adequately realise as yet, but of its power as one of the most mighty links in the chain that binds we British men and women together there can be no doubt. Already we owe a vast debt to science; we shall be infinitely greater creditors in the near future and, I trust, grateful ones.

SIR GODFREY LAGDEN

From Sir Godfrey Lagden, K.C.M.G., K.B.E., Vice-President of the Royal Colonial Institute, and of the African Society.

In the past the various peoples of the British Empire have been more or less in the dark as to each other's thoughts and doings. Possibly there is no more striking way in which we reveal our true characters than by our celebration of Christmas. This is one of those occasions when the world may see Britons as they really are. At this season a mutual exchange of courtesies and information by radio between members of the Great British family will turn darkness into light and result in better feeling and better business.

Fro

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TOR.

From H.H. The Maharajah of Rajpipla.

MAHARAJAH OF RAJPIPLA

I have not spent a Christmas in England for many years, and it would be an immense pleasure to me to take part in a radio Christmas party, even though I should be divorced from the scene of it by thousands of miles. But distance does not mean anything nowadays.

I hope that the plan put forward by the Editor of POPULAR WIRELESS *will be taken up by the B.B.C., so that the whole British Empire may gather, in imagination, round the same Yule-log in the Mother Country. By making use of what is undoubtedly the strongest sentimental note in the world, I see broadcasting assuming a new and very definite importance.*

After my visit to London this year I took back to Rajpipla with me three additional powerful sets, and I shall look forward with a great deal of pleasure—and I might say excitement—to such a Christmas party. I shall also make arrangements for as many people as possible to listen-in as well. I hope that all over the Empire similar arrangements will be made, for Christmas Day in this respect affords an opportunity that no other day provides.

* * *

om Miss Pauline Frederick, the World's most famous screen actress.

u are going to have a Christmas party by wireless next year, and that party is going to be st from London to all parts of the world, then I am really sorry that I am going back home. If I could, believe me, I would have waited a whole twelve months for it!

What a wonderful idea! After all, most parties—even Christmas parties—are very selfish. Just you and your invited friends. But how different to provide a real Empire-wide Yuletide gathering. That seems to me to be the nearest that we have ever been to the real Christmas idea of things.

And London, after all, is the only place in the world from which such a party could be broadcast. In America, London always seems to us the spiritual home of everything belonging to Christmas; we imagine the Strand on Christmas morning under the snow, and we still think of Mr. Pickwick enjoying himself at Dingley Dell.

It is the Christmas party which everyone will want to hear. Where I shall be on December 25th, 1928, I don't know, but I shall do my best to be near a radio set so that I can drop in as a guest at the biggest party that has ever been held. That is, if you will allow an American who loves the British Empire very much to do so!

MISS PAULINE FREDERICK

* * *

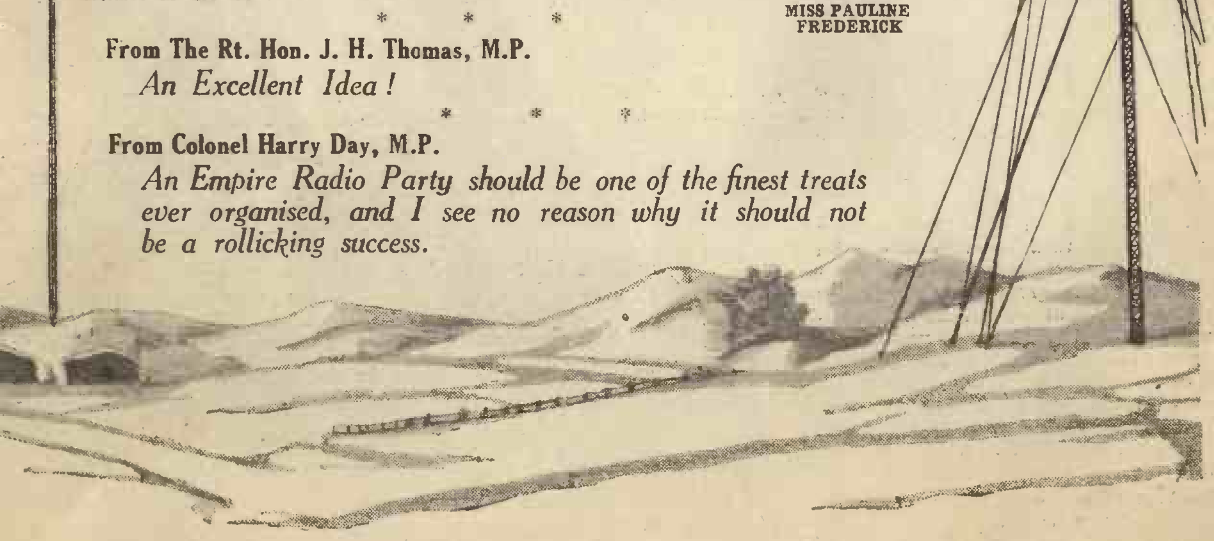
From The Rt. Hon. J. H. Thomas, M.P.

An Excellent Idea!

* * *

From Colonel Harry Day, M.P.

An Empire Radio Party should be one of the finest treats ever organised, and I see no reason why it should not be a rollicking success.



Broken Notes

By G. V. DOWDING, Grad.I.E.E.

(Technical Editor.)

ARE your loud-speaker results illusions or are they delusions? There is a difference—or, at least, there is in the way I intend these words to be read upon this particular occasion. This is what I mean. The loud speakers of some enthusiasts, but only a few, eject such perfect sound waves that if one were to close one's eyes or switch out the light one would be compelled continually to say such things as " Hear, hear ! " " Nastly outlook, that, old man," " Thanks very much ! " " Good-evening, sir ! " and so on. That is what I would call complete illusion, the more or less perfect reproduction which should be every true radio enthusiast's one ideal.

" So Mellow."

On the other hand, you have those outfits which emit what I style " sugaration." The proud owner of such a set will draw your attention to the " mellowness " of the music. All the strings sound as though they are playing in treacle, the brass takes on the subdued cadence of wood-wind, the drums resemble the soft sploshing of streams of very thick oil falling on more oil, there is such damping, such sogginess, that the piano might well be operating in a bath of mercury. Yet the happy exhibitor will beam with joy as he says " So *mellow* ; you might be in the studio." That is a complete delusion.

Now it is extremely difficult to achieve the first very desirable state of affairs and rather easy to attain " mellowness." Providing you tack plenty of capacity across your transformers, loud speaker, and other such points, and use a cone type of speaker having a large diaphragm, or a horn speaker having a nice thick wooden flare, or a well-boxed-in type of reproducer, " mellowness " is yours. But while you will no doubt obtain sounds which will soothe in their sugariness, you will never experience the thrill of the silvery brass (or should I say the silvery silver and the brassy brass ?), the soul-stirring scritch of the strings, and so forth.

Permissible " Coloration."

And the pity of it is that thousands are daily drugging their aural senses with morphined music ; a multitude of " mellowness " manufacturers are even now indulging their vice. Not that just a trifle of " coloration " isn't permissible, more particularly on the part of the speaker. This will smooth over little resonances in the average set which otherwise would not be tolerable. But wholesale " mellowing " is for the wine trade only and not for the true radio enthusiast.

Musical sounds are remarkably complex structures. There is not just one smooth " swish, swish " up and down for, say, middle " C " on the piano. There are all sorts of secondary ripples, which, known as " overtones," lend the note the timbre which distinguishes the instrument from which it is projected. Take an orchestra of forty different instruments (you could form one quite easily). Every one of these instruments could emit a note of exactly the same fundamental frequency, but you would be able to pick out the violin from the piano or the flute by its distinctive " timbre." Your radio set should be able to pass out clean notes, each of which retains a very full measure of its original timbre.

I say *should*, you will notice, because it is going to mean a moving-coil loud speaker, super-power valves, and so on, if you would attain perfect " naturalness." But if you cannot run to these you can at least endeavour to preserve instead of " conserve " your chorus of frequencies as they proceed on their journeys from your aerial to your speaker.

Octave Shifts.

And bear in mind that there are ways of shifting notes up and down as much as an octave. Some loud speakers do this, specially with the lower tones, with the greatest of facility and so cunningly that you are deluded into believing you have a full bass if you are not " au fait " with the bottom of the scale. It has truly been said that one doesn't miss the lower notes if one has never had them. But as truthfully it can be said that one never misses anything of which one has no knowledge. But listen to the big drum, the pedal notes of the organ, the double basses of a large orchestra, the sixty cycles of syncopation on a set and speaker that does such things real justice, and another page of radio interest opens for you.

Let me tell you how you can do this without running to fifty-guinea outfits. First of all give up that idea of developing Town Hall volume with a two-valve set. Generally speaking, the first requirement is plenty of " low mag." stages. Instead of trying to work up " full loud-speaker " strength by using one or two high amplification amplifiers, have two or three lower amplification stages. Valves are much cheaper these days, and resistance-capacity couplers are not expensive items. Endeavour to operate your set with no reaction at all—at least, when you are prospecting for low notes from your local station. Be as generous as you can in respect of H.T. and of the use of power or super-power valves.

Not Guess Work.

Avoid cheap foreign low-frequency transformers and chokes, and pay as much for such items as you can. There is nothing like a bad low-frequency transformer for snipping off the low notes. Buy a cone speaker of good make, such as the Amplion, Marconiphone, Brown, and so on. There are plenty of them at really reasonable prices.

There are all sorts of other rules and regulations for which I have no space to discuss here, but you will find them fully dealt with in other " P.W." articles that are published from time to time. And in this connection I would like to point out that we are now able to work out set designs to conform with definite quality standards. Don't believe that pessimistic fellow who says it's all guess work and nobody really knows how a receiver works. We don't know everything about wireless yet any more than anyone knows everything about anything, but we do know how to make a fiddle sound like a fiddle after its sounds have been wheedled from a loud speaker.

The B.B.C is putting over some excellent stuff these days, from a technical point of view, but I can conceive of no tragedy to equal in poignancy Mr. Percy Pitt or Capt. P. P. Eckersley being forced to listen for one whole evening to one of those so-called " mellow " sets!

A member of the " Popular Wireless " Technical Staff testing components. Every part of a radio outfit must be of a high standard of efficiency if first-class results are to be obtained. Always buy British radio gear of well-known branded makes.

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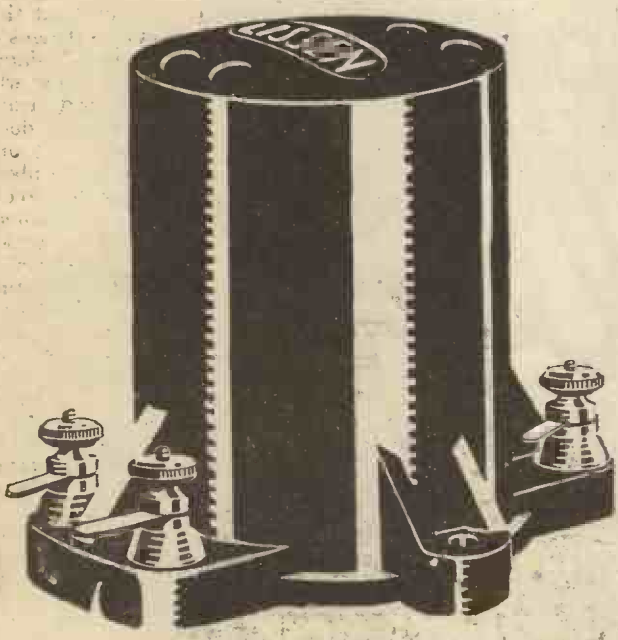

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Also use the Lissen H.T. Battery

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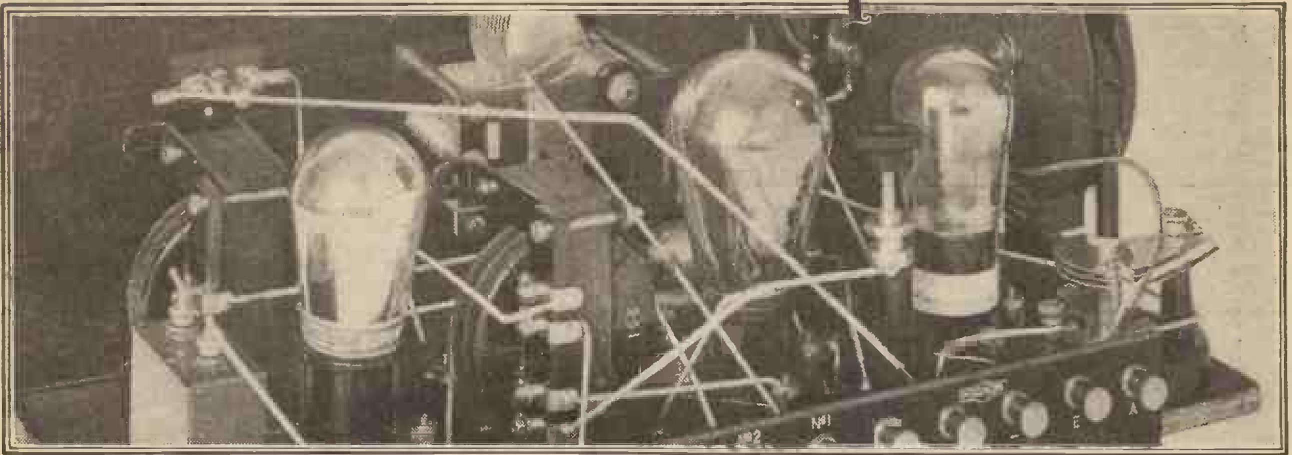


This is the first of a series of three articles which form a continuation to the recently published popular series for the new amateur.

(1) First Considerations.

By G. P. KENDALL, B.Sc.

HUMAN nature being what it is, once perfection is reached in any direction one is rather apt to lose interest, simply because there is no more to be done and further progress is impossible. That is probably one of the many reasons why wireless is so fascinating a hobby, for perfection is never quite achieved. One can go on improving and improving, yet one never arrives at a state of affairs when one can truthfully say, "My results are perfect in every way, and no further improvement is possible." Always there is the possibility of, perhaps, just a little more volume to fill the room properly, a little more selectivity to cut out the local more easily, a little more faithful reproduction from the loud speaker, and so many of these matters can be attended to with just a little more work and experimenting, that it seems that one can go on indefinitely and never lose interest.

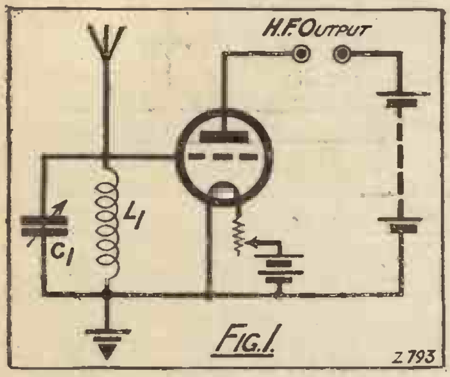


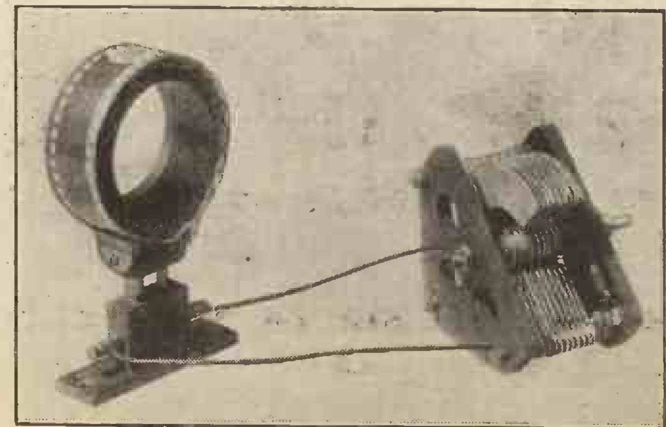
FIG. 1.

Louder Signals,

Those who have been following the special series of articles for the new reader in recent issues of "P.W." will by now have acquired a fair idea of what can be done with a single valve in the more straightforward types of circuit, using the valve as a rectifier with or without reaction, and very likely by this time have begun to feel that they would like to investigate some circuits of greater possibilities. The range and sensitivity of a single-valve receiver can be enormously increased by the judicious use of reaction, but a time is bound to come when the user wants to amplify his signals still further, and begins to think of the addition of another valve so that he may get louder signals and still more distant stations.

Two Methods,

Now, when one decides to try and amplify the signals obtainable from a simple detector valve, there is a choice of two methods. First, we can amplify the low-frequency rectified current which would otherwise be used to work the telephone, and then put our amplified currents through the 'phones or even a loud speaker. This is called low-frequency amplification, and is a process which goes on immediately following upon the detector valve. It will be dealt with, of course, at a later point in this series. Secondly, we can take the high-frequency currents just as they are received from the aerial circuit and amplify these by means of a valve working in a suitable way, and then pass the output from this high-frequency valve, as it is called, on to the detector valve for rectification as usual. In more elaborate sets, of course, both methods will be used.



Just a coil and condenser forms the simplest kind of H.F. intervalve coupling circuit.

Now, there is nothing very special which need be done to make a valve act as a high-frequency amplifier, since the valve is a particularly accommodating piece of apparatus, and it will amplify any currents of an oscillating or fluctuating nature which are applied to it, so that it is merely a matter of feeding the currents into it and providing some means of passing them on from the output side of the valve to the next stage of the set. Evidently all that we need do to make the valve act as a high-frequency amplifier is to connect it across some part of the circuit when the high-frequency incoming signals are flowing, and this, in the case we are considering, is the aerial and earth circuit.

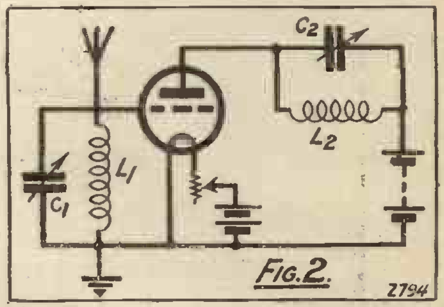


FIG. 2.

Turning to Fig. 1, it will be seen that we simply connect our H.F. valve grid and filament across the tuned-aerial circuit in exactly the same way as we should connect a detector valve, but, of course, we do not provide any grid condenser or leak or other means of making the valve rectify. It will, therefore, act as a pure amplifier, and the signals flowing in the tuned circuit L_1-C_1 will be reproduced in a magnified form in the anode circuit of the valve. In this same diagram, it will be observed that two

(Continued on next page.)

THE ABC OF H.F. AMPLIFICATION.

(Continued from previous page.)

terminals are provided marked "H.F. Output," from which it is understood that we shall take our magnified signals and apply them to the detector valve. So far so good, but to obtain the desired effect, we must provide some sort of output circuit in the anode circuit of our H.F. valve, in order that it may amplify properly and also give us our amplified signals in a form which will be most effective for applying to the detector which follows.

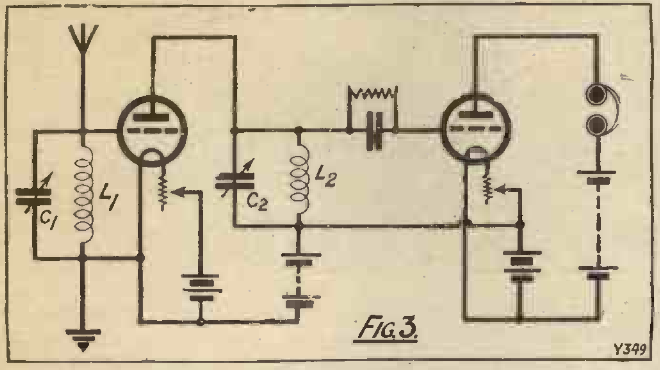


FIG. 3.

The Tuned Anode.

Perhaps the simplest and most easily understood form of output circuit which we can use is the familiar tuned anode, which is illustrated in Fig. 2. Here we have another coil (L_2) which is tuned by the condenser C_2, and when this is brought into step with the other tuned circuit, C_1–L_1, we shall get amplified signals built up in it, and, consequently, we can connect our detector valve grid and filament across it just as though this were the aerial circuit.

Fig. 3 shows how a detector valve can be connected across the tuned-anode circuit of the H.F. amplifying valve, and the reader should examine this diagram carefully to see just how the various connections are made in the simple theoretical form. The usual grid leak and condenser is provided to make the second valve rectify, and the lead from this goes to the anode end of the tuned-anode circuit. This corresponds to the high potential or aerial end of a simple detector valve receiving circuit, the filament lead from the detector valve going to the lower end of the tuned-anode circuit, and in this case the H.T. plus end, which, of course, corresponds to the earth.

Fig. 3 was drawn specially to make the principles of working of the circuit as clearly as possible, but the reader must realise that this is not exactly a practical method of arranging the circuit, because he will observe that two separate sets of batteries are needed, one for the H.F. valve and one for the detector. This, of course, is wasteful, since by making certain little changes the circuit can quite easily be arranged to use one accumulator and only one H.T. battery to serve both valves. Actually all that we need to do is to modify the connections of just one little component, and that is the grid leak of the detector valve. In Fig. 3, you will observe that the grid leak is connected in what is called the parallel position—that is to say, straight across the grid condenser. Turning now to Fig. 4, you will see what must be done in order that common batteries may be used for the two valves. The grid leak is now connected directly between the grid of the valve and the positive end of the filament, the same H.T battery feeds the anode circuit of both the valves, and their filaments are both lit from the same accumulator.

Obviously, we cannot leave the grid leak in the previous position, that is to say, across the grid condenser, because if we did so the positive potential of the high-tension battery would be communicated to the grid of the second valve and would make it positive in regard to its filament and upset its action. With the grid leak connected in what is called the series position, however, as shown in Fig. 4, the positive potential of the H.T. battery cannot get to the grid of the second valve, because the grid condenser keeps it off, and so the detector can work in the normal way. With separate batteries of course, as in Fig. 3, this question did not arise, because although the positive potential from the first H.T. battery was applied to the grid of the second valve through the grid leak, it was also applied to the filament circuit of that valve so that it did not produce any difference of potential between grid and filament.

Transformer Coupling.

Fig. 4 shows a practical type of circuit, with which very fair results can be obtained if certain little precautions are taken.

Before we leave this branch of our study of simple H.F. circuits, just a few words about another form of what is practically the same thing as the tuned anode, namely, the old type of tuned-transformer coupling. Here we have the same tuned-anode circuit, but instead of connecting the detector valve across this, we connect it across a secondary winding, which is closely coupled to the tuned anode. These two windings together form what is called a high-frequency transformer, and in the days when this circuit was popular, it was usual to employ one of the barrel or mushroom type of four-pin transformers. The functioning of this circuit is practically the same as the tuned anode, except that the signals are not transferred straight to the grid of the detector valve, but are transferred from the primary to the secondary winding by electro-magnetic induction, or transformer action. In theory, there may be only slight difference between the two circuits, but in practice there is perhaps some slight advantage to be obtained from the use of the transformer, chiefly in matters of stability and to some extent in selectivity. As regards stability, this is probably largely a matter of a false impression in the case of the transformer-coupled circuit, because the old barrel-type transformers were usually less efficient as coils than the type of inductances used in tuned-anode circuits, and consequently there was less trouble from instability.

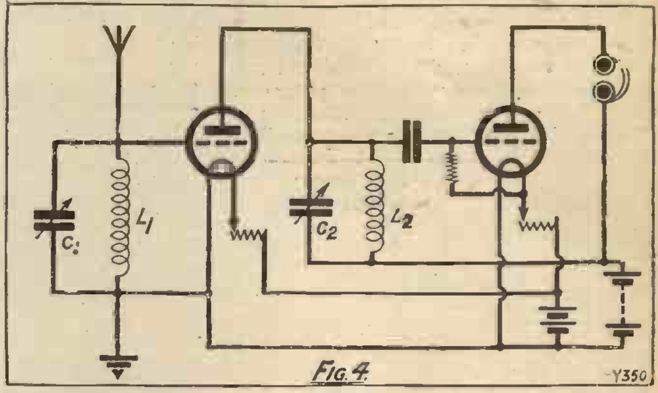
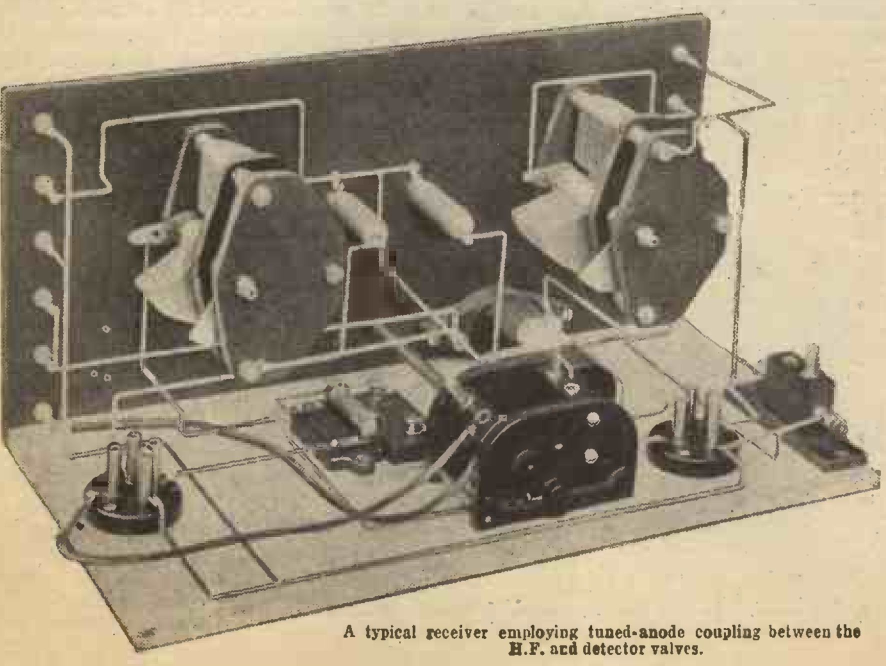


FIG. 4.



A typical receiver employing tuned-anode coupling between the H.F. and detector valves.

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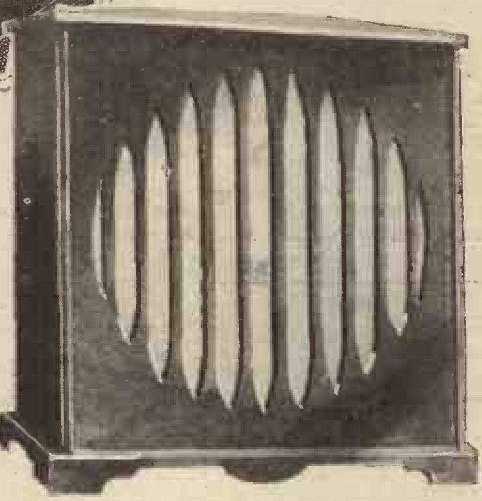

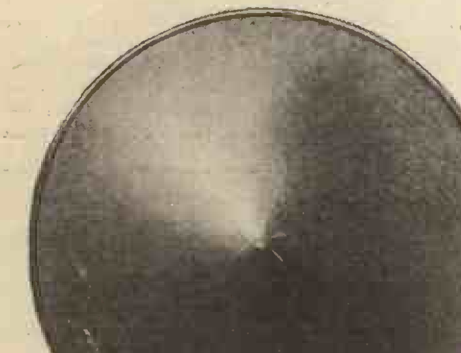

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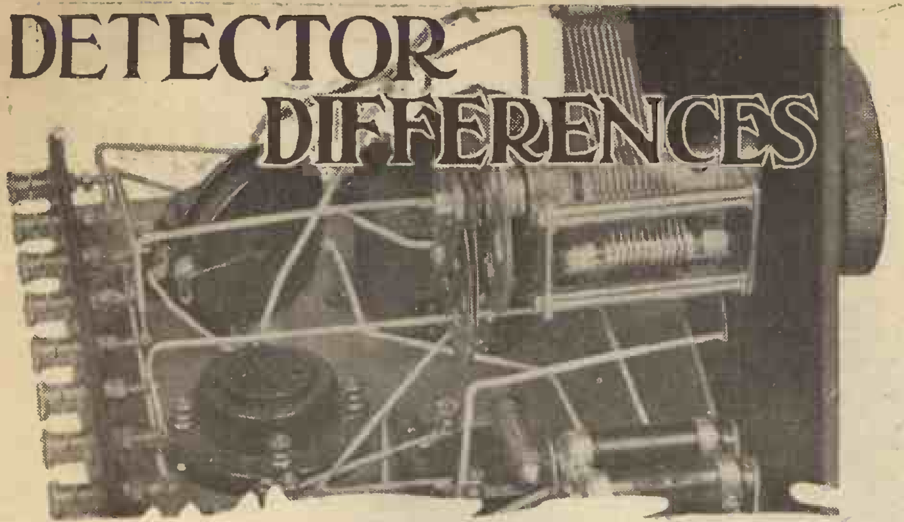
DETECTOR DIFFERENCES



By W. JAMES.

EVERY wireless receiver has to have a detector, and when this is a valve, only too often it is found that the valve is put in the receiver and used without any great attention being given to see whether it will work efficiently.

One form of valve detector uses a small condenser and high resistance, popularly known as a grid condenser and leak. Grid current is encouraged to flow in a detector of this type, and for a given valve it is found that the amount of grid current which flows under normal conditions—that is, when there is no signal—determines, to a large extent, the effectiveness of the valve as a detector. The grid current which flows is controlled by the voltage of the grid with respect to the filament, and the majority of valves require that the return end of the grid leak be slightly positive, with respect to the negative side of the filament.

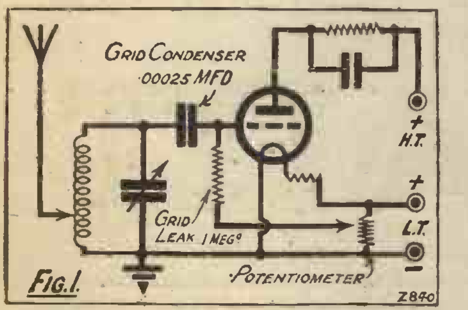


Fig. 1.

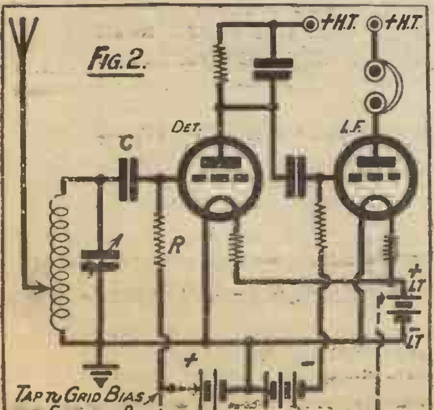


Fig. 2.

It has to be remembered that the grid is not connected directly to the filament battery, however, but is connected through a high resistance of 1 to 5 megohms, with the result that the voltage of the grid is not the same as that applied to the grid leak by the battery. Thus, if we try different grid leaks, the voltage of the grid will alter and so will the grid current. Here, then, is one method by which the grid potential can be varied for the best results. We can try different values of grid leak and in this connection readers will remember that a year or two ago adjustable grid leaks were very popular. But many of those available were apt to vary with use and after a time seemed to become noisy.

The Best Adjustment.

A fine adjustment of the normal grid voltage and hence of the efficiency of the detector can, however, be obtained by another method. We can use a grid leak of known value such as 2 megohms and connect its return end to a potentiometer which has its ends connected across a filament battery (Fig. 1). When a weak signal is being received it is very easily proved that the setting of the potentiometer plays an important part in the operation of the detector, for signals will almost invariably be increased in strength by setting the potentiometer in one particular position. This position will, of course, depend on the valve used and the value of the grid leak, and in those instances where it is necessary to make sure of obtaining the very utmost from a receiver, a potentiometer for setting the detector is a very useful component.

When the extra expense of a potentiometer is objected to, or when this additional control is considered not advisable, the grid circuit can be connected to one of the cells of the filament battery, or to the grid-bias battery as shown in Fig. 2. Quite a material improvement in signal strength can often be obtained by this simple means. All that is required is an extra wire which is connected as shown in the figure.

Double Duty Detectors.

In many receivers the detector valve has to do two things—first, to rectify the signals and, secondly, to enable a smooth control of reaction to be obtained. We, therefore, usually find, as might be expected, that the adjustment of a detector which is best from the point of view of obtaining a smooth control of reaction, is frequently not the best for maximum rectification efficiency. Here again the potentiometer control, or the tapped battery method, will enable the best results to be obtained.

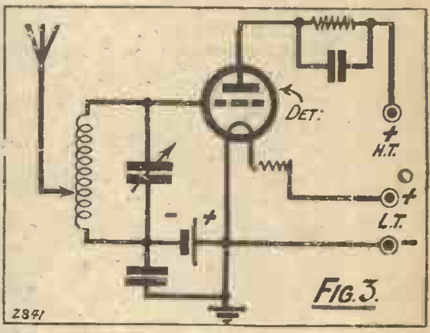


Fig. 3.

When we come to the anode rectifier, you will find it of the greatest importance to provide a more or less exact adjustment of either the grid bias or the anode voltage. In this method of rectification, a sufficient negative grid bias is given to the detector to prevent grid current, and one part of the incoming signal alters the anode current while the other does not.

The sensitivity of this type of detector depends enormously on the voltages used, and the best value of grid bias will have to be chosen to suit the type of valve used for rectifying. When a valve of the R.C. type is used as a detector, a grid bias of negative 1·5 is usually suitable. Such a valve should have R.C. coupling, and the H.T. voltage will have to be of the order of 90 volts.

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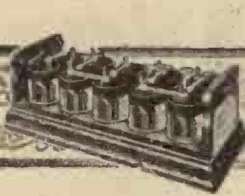

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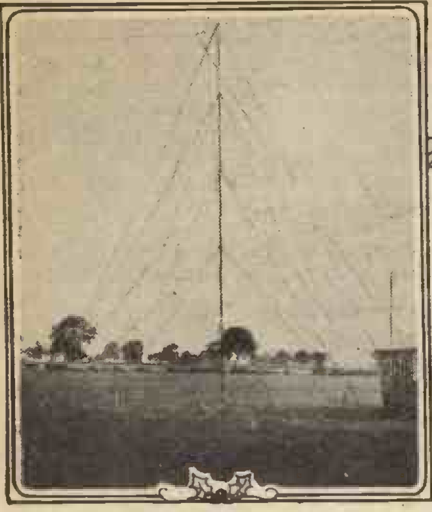


EMPIRE BROADCASTING

With the growing interest in the development of short-wave wireless this article by the High Commissioner for Australia is both topical and valuable.

By Major-General the Hon. Sir GRANVILLE RYRIE, K.C.M.G., C.B.

EMPIRE broadcasting has now been brought within the range of practical achievement. This much has been proved by the success which has attended the experiments of Mr. Gerald Marcuse in the transmission of wireless concerts to Australia via his private wireless installation at Caterham, and also by the reception in this country of the concert transmitted from 2 F C, Sydney, in September. This transmission, it will be remembered, was picked up by the B.B.C. "Listening Post" at Keston, relayed to 2 L O, and broadcast throughout Great Britain. I am quite aware that many technical difficulties have yet to be overcome before perfect reception, either in Great Britain or in the Dominions, can be assured, but I am confident that before very long these difficulties will be solved and Empire Broadcasting become the order of the day.

Cheering News.

In its official report on the Sydney broadcast the B.B.C. stated that this relay from Australia was, if anything, slightly better than the first relay from America which was attempted by the B.B.C. two years ago, and, considering the advance which has been made in reception from America, "it is reasonable to hope, in view of the experience of trans-oceanic broadcasting which has been gained in the past two years, that reception from Australia will improve even more rapidly than reception from America." That is cheering news, at any rate, from the point of view of reception of Australian transmissions in this country.

Australia is Alive.

In regard to Empire broadcasts generally we have the assurance of the B.B.C. engineers that their experiments will have advanced so far as to enable them to open an experimental short-wave transmission station for Empire transmission and reception before the end of the year.

Empire Broadcasting, of course, is dependent not only on the B.B.C. It calls for co-ordinate action on the part of the broadcasting authorities in all the Dominions.

As far as Australia is concerned, the experimental broadcast from Sydney, to which I have referred, was the first official Empire transmission to be attempted, and indicates that Australia at least is alive to her responsibilities in this matter. The other Dominions, I am sure, are ready and willing to co-operate; but much will depend on the B.B.C., to whom we all look for guidance and help.

As a medium of fostering the goodwill and assisting the interchange of cultural ideas between the Mother Country and the Dominions, Empire broadcasting has unlimited possibilities. It could be used to broadcast information on subjects affecting the well-being of the Empire, and to encourage trade and development by disseminating knowledge of the resources and products of the Empire. I may be looking far ahead, but is it not possible to anticipate the day when special lectures on Australia will be broadcast from Australia to the schools in Great Britain? Then, from the entertainment point of view, I can well imagine the delight of the people in New South Wales listening-in to a running commentary of the Test Match between England and the "Waratahs."

Major-General The Hon. Sir Granville Ryrie.

In the Bush.

I appreciate that these suggestions, which are made at random, could scarcely be fitted into an ordinary broadcasting programme, but I have set them down to indicate the possibilities of a broadcasting service between Great Britain and Australia. There would be no difficulty in arranging suitable programmes, educational as well as entertaining; for Australia is thoroughly British in population, in ideals, in its customs, its culture and its sport.

There is another phase of Empire broadcasting which I should like to emphasise. The development of wireless has been a great boon to settlers in the remote parts of our Dominions and Colonies. From personal knowledge I can say that the broadcast programmes from Sydney, Melbourne, and other capital cities in the Commonwealth, have done much to interest and amuse settlers in the bush.

That Personal Touch.

These pioneers of the Empire are the people who would appreciate most of all an Empire broadcast from 2 L O. It would help them to forget their loneliness in the thought that they were linked up with the heart of the Empire. Therefore it seems to me that Empire broadcasting, properly developed and maintained, might well become a factor in the settlement of the more or less empty parts of the Empire. A regular series of broadcasts from London would keep the Dominions in touch with affairs at home, and the fact that the news is transmitted, so to speak, "by word of mouth," gives that personal touch which makes all the difference.

Look out for P.W.'s Christmas Week Issue, on sale Dec. 22

B.B.C. AND THE RADIO TRADE.

Some Criticisms and Some Suggestions.

By THE EDITOR.

When the B.B.C. was made up of manufacturers of wireless apparatus, it was the fashion for ill-disposed critics to suggest that the broadcasting service was wrongly exploited in the interests of the radio trade. Far from this being the case, it is doubtful if the old board of manufacturing directors availed themselves of any of the numerous opportunities of turning their position to account in a selfish way. Sir John Reith has declared repeatedly that he received his public service mandate right at the beginning of the Company.

Admitting that there was no wrongful exploitation of the medium by the old B.B.C. Board, was there any conscious progressive policy in support of British radio enterprise? Careful examination of the history of the Company reveals no sign of such a policy. This would appear to be a surprising omission, but probably it was due to the chronic difficulties experienced in securing anything resembling a coherent unified policy for the radio industry.

In Better Position.

At the time of the change over from the Company to the Corporation, there was at first no little anxiety on the part of the trade as to the possible withdrawal of B.B.C. support. It was not generally realised that the only support which the B.B.C. had given was in the provision of programmes requiring wireless apparatus for their reception! Beyond this, there was literally nothing to withdraw. There were some, however, intelligent enough to perceive that the B.B.C. as a State Corporation would be in a position to do very much more for the radio trade than the B.B.C. controlled by the manufacturing element.

It was apparent to these observers that the Corporation could do many things, and be commended for them, which if done by the Company would involve public scandal. At the beginning of this year, therefore, it was hoped in many quarters that the Corporation would lose no time in initiating a wisely conceived policy to support the British radio industry.

Not Enough Activity.

There have been the customary asseverations of friendship, and two or three detached gestures; but beyond this, nothing. The blame does not fall entirely on the B.B.C. There is in existence a strong committee of the trade, charged specifically with the responsibility of safeguarding trade interests in broadcasting. The sum total of the results of the activity of this committee during nine months is a slight revision of the morning concert times of 2 L O and 5 X X. It may be that the committee has met serious obstruction, or unexpected difficulties. If so, these should be given full publicity.

The trade as a whole is entitled to a much more complete account of the activities of this organisation than has been offered so far. Let the committee take a leaf out of the book of the "Wireless Organisations Advisory Committee," and release for publication a detailed account of its work for the past nine months. It may be that all is well, but the absence of information, accompanied by the absence of action, is disconcerting to general confidence.

No Initiative.

And what of the future? Is a constructive policy feasible? And if so, what should it be? My view is that these questions, like most others, are answered best by reference to the arbitrament of common sense. This year the B.B.C., although deplorably late, *did* take the initiative in connection with National Wireless Week. But efforts of this kind, fruitful as they are at the moment, should be linked and integrated. They do these things much better in Germany and the United States. There is ample room for a small paid staff to do nothing else but develop and co-ordinate liaison between the B.B.C. and the trade. This should have eventuated from the ill-fated British Radio Development Association.

Technical Talks.

As for a continuous constructive policy, let it be laid down as fundamental that the B.B.C. quite definitely and firmly sides with British radio apparatus as against foreign radio apparatus. There should be some qualification with regard to radio apparatus made in the Dominions, but otherwise the B.B.C. should be pronouncedly and avowedly protectionist with regard to all wireless apparatus.

Having established this fundamental policy, with the full cognizance of the Board of Trade, the B.B.C. should then develop an educational campaign with a view, not only to advertising British radio apparatus, but also to assisting in the technical education of listeners generally.

"Get on with the Job!"

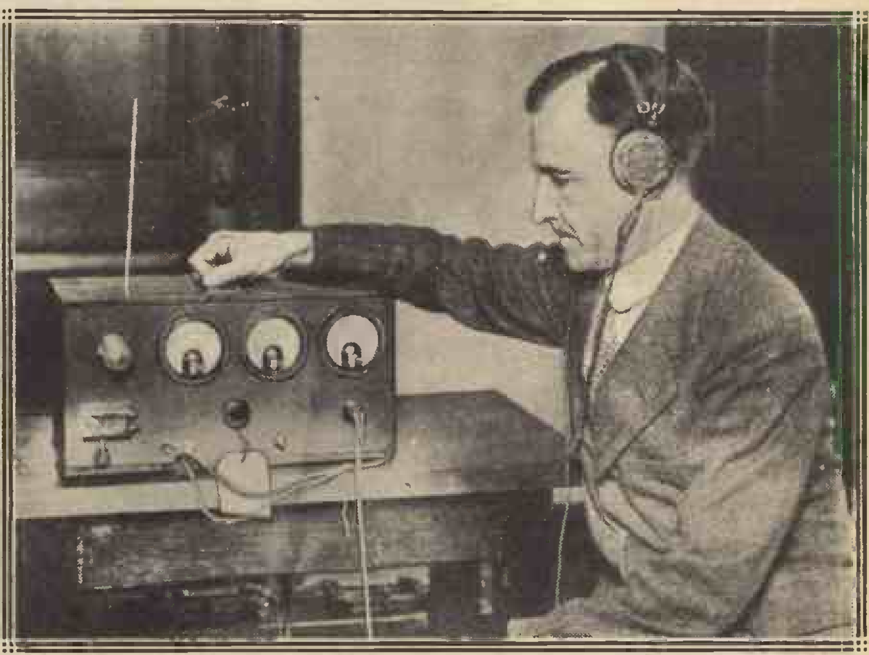
Of course, the Wireless Technical Press should be invited to collaborate, both in the preparation of the syllabuses for the series, and in their execution.

The B.B.C. is fond of calling attention to the widening scope of its educational work. This is entirely commendable as far as it goes. But it is curious that an organisation so alert and enterprising in most other directions should have failed to realise the programme value of sound technical talks rightly placed and skilfully given.

Their first purpose should be to correct notorious elementary popular misconceptions. Their second purpose should be to set listeners thinking along the right lines technically; their third purpose should be to spread intelligent interest in the technical side of wireless reception. As each or all of these purposes may be served, so, inevitably and progressively, will the demand for receiving apparatus and accessories develop and expand.

The B.B.C. should then take steps to insure that every new technical invention and development is appropriately recorded either in the News Bulletin or in special announcements.

The omission of this in the past has been serious. It is in the power of the B.B.C. to regain for radio some considerable measure of the romantic glamour which enveloped its infancy. Incidentally, but quite legitimately, this glamour is first-class business. Get on with the job!



Dr. J. H. Dellinger, Chief of the Radio Laboratory of the American Bureau of Standards, who spent three months in Europe studying radio conditions. He is shown with the special wave-meter he used for checking the frequencies of the various broadcasting and commercial stations. Dr. Dellinger also attended the recent International Radio Conference in Washington.

Good reception—always

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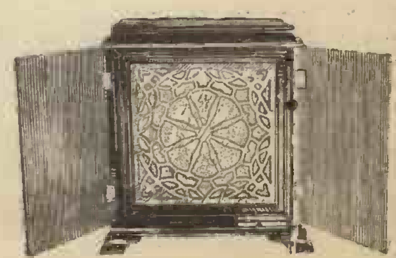

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Aberdeen
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London
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Dublin
Sheffield
Swansea
Lausanne
Hamburg
Paris-Toulouse
Birmingham
Bournemouth
Glasgow
Cardiff
Edinburgh
Liverpool
Copenhagen
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Amsterdam
Seville
Munster
Rome
Breslau
San Sebastian
Vienna
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Oslo
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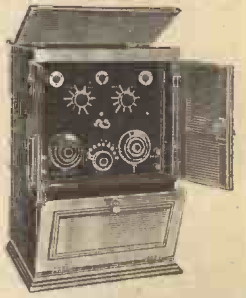

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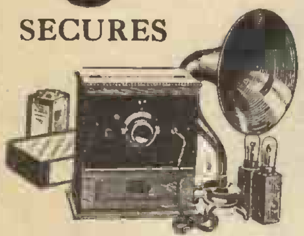

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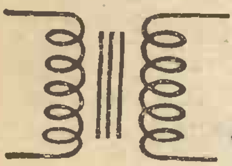

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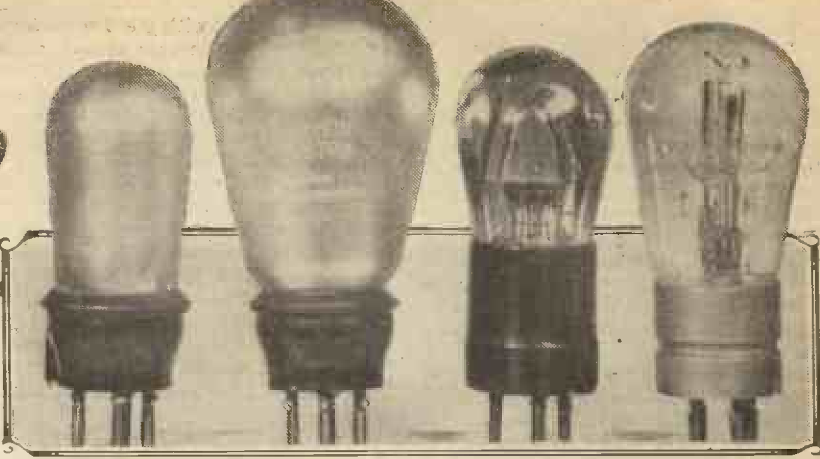
Which is the BEST VALVE?



If you have bought, or built, a new set, and are doubtful as to what valves you require this article will help you in your choice.

By KEITH D. ROGERS.

I AM very often asked by people who have either just bought new sets or had them made for them, the question "What valve shall I get?" This is always a very difficult question to answer if one has no knowledge of the set concerned, because it is difficult to explain to the non-technical man that he cannot just buy three or four valves and place them in any position in his set and expect them to work satisfactorily.

An early model of the Interdyne self-balancing H.F. valve.

Unfortunately, the choice of valves for a radio receiver is not quite such a simple business as it might appear, for there are one or two points that one has to consider, which, unless they are attended to, will prevent the listener from obtaining the maximum results from his receiver.

The main thing governing the choice of a valve in any set, is the low-tension supply. As a rule this should be decided before the valve is chosen, and the majority of people find that they have to make a choice of valve from the 2-, 4- or 6-volt class to suit the accumulators they buy. Too much has already been said about the various merits of the 2-, 4- or 6-volt classes of valves, so that there is no need for discussion on that point here.

Two, Four or Six Volts?

They are all very good, although perhaps a little more "punch" can be obtained from a 6-volt valve, especially if a large volume is required. But for the average man who will use a two, three, or four-valve set just for comfortable loud-speaker reception on his local station, with perhaps one or two others thrown in if he can get them, a choice among the 2-, 4- or 6-volt classes will give almost equally good results, though the two-volters may not neutralise so well as their 6-volt brothers.

The first thought in the actual choice of valve for any set concerns the particular circuit employed in that receiver. For instance, if a man has a four-valve set employing one H.F. stage, a detector and two note-magnifying stages, he will have to choose valves so that they can operate the set successfully in those four stages. It would be no good his putting a low-frequency valve in the high-frequency stage and expecting to get really good results, while it would be even more absurd to put a high-frequency valve in the last stage and expect it to carry the volume required to operate his loud speaker.

What he does, then, is to look through his circuit, or if he does not understand the technicalities of wireless to ask a friend to give him some assistance, and he finds that he has, say, one neutralised high-frequency stage, an ordinary detector working on either grid leak or the anode bend principle, followed by a resistance-capacity-coupled low-frequency stage. This latter is, we will say for the sake of argument, transformer coupled to the last stage. Now, this is a perfectly typical receiver, and we will see what valves are likely to give the best results.

Four Valve Types.

Roughly speaking, valves can be classified into about four types, and these are generally known as R.C. valves, H.F. valves, L.F., and power or super-power valves. Thus the mere classification gives one an idea as to where the valves are likely to work best, and it only remains for the average man to choose his particular valves and to place them in their correct sockets.

If he does do this he will not go very far wrong, for if he places an H.F. valve in an H.F. stage, a resistance-coupled valve in a stage followed by resistance coupling, an L.F. valve in an L.F. stage, and then a power or super-power valve in the last stage, he is sure to get moderately good results, though he may not get the absolute best from his set. In order to obtain this, a little care must be taken in the choice of the valves, and it is with a view to helping the man who wants to get the utmost out of his receiver that this article is written.

It is hopeless in such a short space to go fully into this matter, but I hope that by the time the reader has reached the end of this chat he will have learned something of the principles on which valves are chosen, and will to some extent benefit from what I have said.

Let us return to the four-valve set we took as an example. The H.F. stage we have found is neutralised, and we have to find a valve suitable for it. In all examples we will consider the 6-volt type of valve, though it must be understood that 4- or 2-volt counterparts can be substituted where 2- or 4-volt accumulators are being used.

The H.F. Stage.

Now, valves really vary a very great deal, though there is no absolute lines of demarkation between any two types of valves. They all overlap a little. So, by looking at the figures on the boxes in the various H.F. valves, or upon the characteristic curves if you are able to understand them, you will see that what is called the impedance or A.C. resistance of the valve may vary between anything from 15,000 ohms to 40,000 ohms. On the list of characteristics these figures will be accompanied by others among which will be the magnification or amplification factor, say, ranging from 13 to 30. These are the two factors which we have to consider, and we find we have a wide range of valves from which we can choose, though they are not all equally suitable for the circuit which we are discussing.

This popular last-stage valve—the D.E. 5A—takes ·25 amp. at 6 volts.

Those with the high-impedance figures and high-magnification factors would do

(*Continued on next page.*)

WHICH IS THE BEST VALVE?

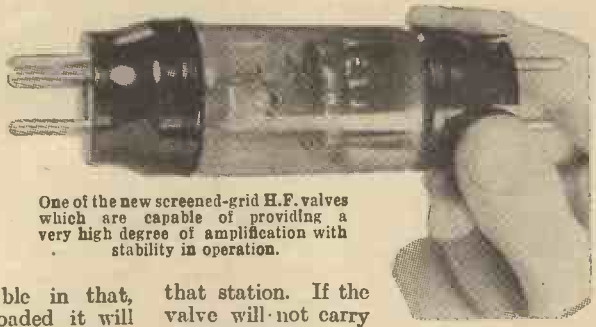
(Continued from previous page.)

better with tuned-anode coupling than with a transformer. Those with the lower figures would do probably better as detectors than H.F. amplifiers, and indeed it will be found in most makers' catalogues that the H.F. valves and the detector valves are grouped together. In other words, you can usually employ an H.F. valve as detector, or vice versa.

Roughly speaking, we find that for average good results, we must take a valve with average figures and, indeed, in practice H.F. valves of 20,000 ohms, or thereabouts, with a magnification of 17 to 20 prove the best in most circuits, and if with the four-valve circuit we want a really reliable H.F. valve, we shall hardly do better than to choose one with about 20,000 ohms impedance and a magnification factor of 17 to 20. Such valves are the P.M.5X., S.S.610 H.F., Cossor 610 H.F., E.S.5 H.F. and D.E.5 B, though these latter have a slightly higher impedance. With such valves in the H.F. position, you will be quite sure of good results.

The Detector Stage.

With regard to the detector stage, there is a little difference of opinion as to whether a high-magnification valve or one with a medium magnification should be used when it is followed by resistance-capacity coupling. Personally, I do not like resistance-capacity coupling circuits to have anode resistance values of more than 500,000 ohms and so, for reasons which need not be stated here, the detector need not be of the very high magnification type, and can quite easily be one of the H.F. valves similar to those chosen for the H.F. stage. Indeed, where strong signals are likely to be received the use of a valve with a very high magnification factor will probably only lead to trouble in that, even if it is not itself overloaded it will overload the first L.F. valve, for, of course, if the detector valve has a fairly low magnification figure (say about 13 to 20) no such danger will arise, and much clearer results will be obtained.



One of the new screened-grid H.F. valves which are capable of providing a very high degree of amplification with stability in operation.

The next valve (the first L.F.) is followed by transformer coupling and we must not have too high an impedance. We also have to remember that, on local stations especially, this valve is likely to have to carry quite a large grid swing, or in other words is likely to have to deal with a fair volume, so that it must be capable of handling this input without distortion.

Now high-impedance valves are not able to carry much input without overloading so that here we have to use a valve with moderate magnification, but yet not likely to cause saturation of the transformer primary by taking a large plate current.

In this case, we find that an ordinary L.F. valve with an impedance of about 13,000 ohms is one to be used, and is one which will give satisfaction as a rule. Such a valve is D.E.L.610. The Cossor 610 L.F., which I have used with great success, would be useful in such a case as this, although its impedance is 10,000 ohms. But in this latter case one has to know what one is doing, and I would not like to guarantee that this valve would work perfectly in every set using a circuit similar to that mentioned. To be on the safe side, I would advise any man with a large set to use a valve having an impedance of about 10,000 ohms for his first L.F. stage, using, of course, suitable grid bias in order that the valve will be working under its proper conditions, and a good make of transformer. There is, of course, quite a lot of technicality behind all this, but it is, unfortunately, impossible to go any further into it in this article.

The Last Valve.

When it comes to the last valve the matter of choice is slightly more difficult, because it is here that the volume is really reaching large proportions. Furthermore, it is essential that a valve be used which will adequately deal with the input of the grid circuit without being overloaded. If overloading occurs the distortion caused will ruin the whole reception, and no matter how good the loud speaker may be, pure results will be impossible.

Therefore in this stage you should choose a valve which will not be overloaded by any amount of signal strength that you are likely to require. In other words, when you are listening to the local station, you must make sure that the valve you have chosen is capable of carrying the strong signals that you will receive from that station. If the valve will not carry this, and if you have no volume control, the only remedy you can employ is to detune the set so that the input from the aerial is not as strong as it would be if the set were perfectly in tune.

Super-Power Valves.

There are two types of valves which can be chosen for the last stage, those known as power valves and those designated as super-power valves. The former are very good, and will carry a certain amount of input, but if really strong signals are required, then you must use the latter. The super-power does not mean that the valve will give out extra magnification, but that it will handle an extra amount of input power without overloading. There are super-power valves available in each class, that is in the 2-, 4-, and 6-volt classes, and the only trouble about running such valves is that they consume rather a large amount of H.T. current. If you use a super-power in your set, and with strong signals it is advisable to do so, you must, therefore, use an H.T. battery of quite large proportions.

Such large-capacity dry batteries are available, and though they cost a little more than the ordinary type, they are well worth it, or if you are out for the absolute maximum of purity and signal strength, wet H.T. batteries will probably be best.

H.T. Voltages.

A third choice remains in high tension from the electric-light mains, and as will have been seen by many of my readers, in previous articles in this journal, the construction of an electric-light mains H.T. eliminator is by no means a difficult task, and it fully repays the time and trouble spent. H.T. derived from this source can be free from hum and the running costs are negligible

But I am diverting from my subject. You will see from the foregoing that the only way to get the absolute best out of your receiver is to choose a valve with an idea of the task which it has to perform. Wrong valves in the wrong sockets will only cause distortion or, at the best, poor results, while if each valve is chosen properly, you may be sure you are getting the maximum out of your receiver.

Another point which I might mention here concerns the H.T. voltages which you may give to your valves While they should not have a voltage very greatly in excess of the maximum rating by the manufacturers they should not be starved. A good all-round voltage for an H.F. valve is 100 to 120 volts, especially if the set is neutralised, while the detector can usually do with 80 to 100 volts, possibly more if anode-bend rectification is being employed. The first L.F. valve should not have less than 100 volts, if it has a large input, while the last valve, if it is of the super-power type, should have 120 as a minimum, the voltage being increased with advantage to 150 or so.

Correct Bias Essential.

It should be remembered that the more the H.T. voltage, the more the H.T. current consumed, but at the same time greater purity is likely to be obtained, provided grid bias is suitably adjusted. Within limits an increase of H.T voltage enables a valve to deal with a greater input than would otherwise be the case, and a great many sets have their results spoiled by the fact that the last valve has insufficient H.T.

Grid bias should also be carefully chosen according to the makers' instructions, and then while signals are being received, it is best to vary the grid bias to obtain the most pleasing results from the loud speaker.

Don't go absolutely blindly by the manufacturers' figures, because they are only given for the *average* valve of any particular type and do not represent *working* conditions, and they may vary somewhat for the particular specimen you are using. Thus, if the H.T. voltage is rated at 120 and for this the grid bias is given as 9, set the voltage to that figure at first, then try varying the grid bias up and down until the best results are obtained, using fairly strong signals for the purpose. If you use weak signals and adjust the grid bias, you will find that adjusting to 3 or 4 volts on either side of the stated voltage will make no difference to the reception, and it is only when strong signals are being obtained that the real advantages of correct grid bias can be noted.

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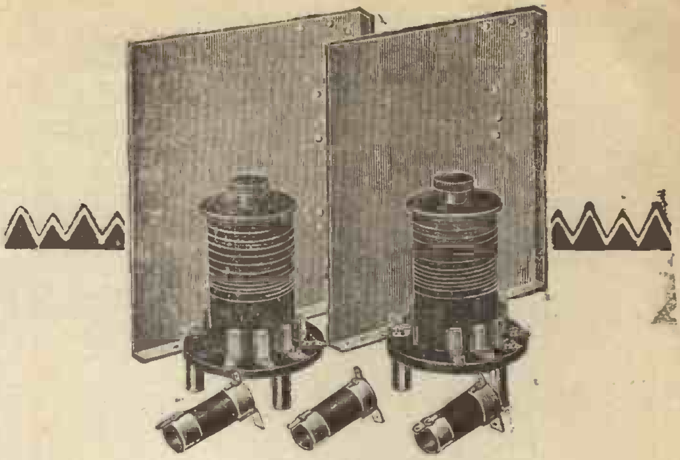

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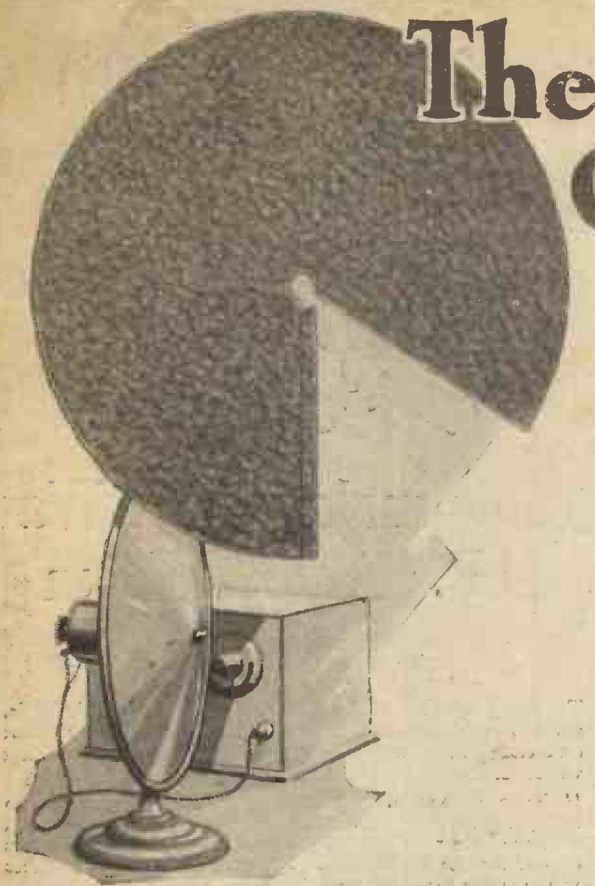

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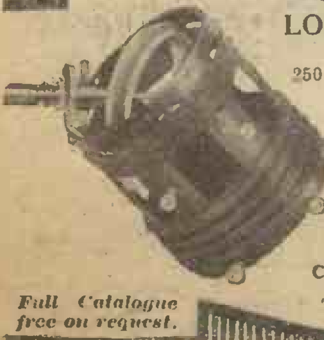


LOW LOSS TWO RANGE COUPLER

250 to 550 and 1,500 to 2,000 metres.

This Tuner is constructed on Low Loss Principles with Solenoid and Bankwound Coils, acknowledged to be the most efficient form of coil winding. It is so arranged that a two-contact Pull-Push Switch shorts the high wave coil, leaving only the low wave coil in circuit.

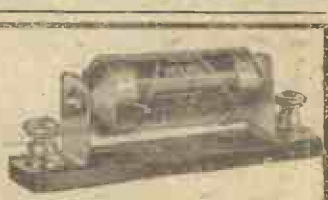
CROWN WORKS, CRICKLEWOOD, N.W.2.
'Phone: Hampstead 1787.

Full Catalogue free on request.

C. E. PRECISION FLOATING VALVE HOLDER.

Anti-capacity and non-microphonic. Made from best Bakelite and fitted with Soldering Tags and Terminals. Price 2/- each.

Write for full list of Complete Details and Circuit Diagram of the ORCHESTRAL THREE, The receiver that sets the Standard of Perfection.



C. E. PRECISION WIRE WOUND ANODE RESISTANCES.

The wire used is specially made for the purpose, and some idea of its quality can be gauged from the fact that it costs £15 a pound. 20,000 to 50,000 ohms, 3/9. 60,000 to 100,000 ohms, 4/9. 150,000 to 200,000 ohms, 7/-. 250,000 ohms, 8/-. 500,000 ohms, 15/-. Clips and base 1/3 extra. Other values to order.

C. EDE & CO., LTD., BYFLEET, SURREY.
Telephone: Byfleet 226. Telegrams: Ceprecise, Byfleet.

HOW TO MAKE THE "PROGRESSIVE" THREE (See Page 835.)

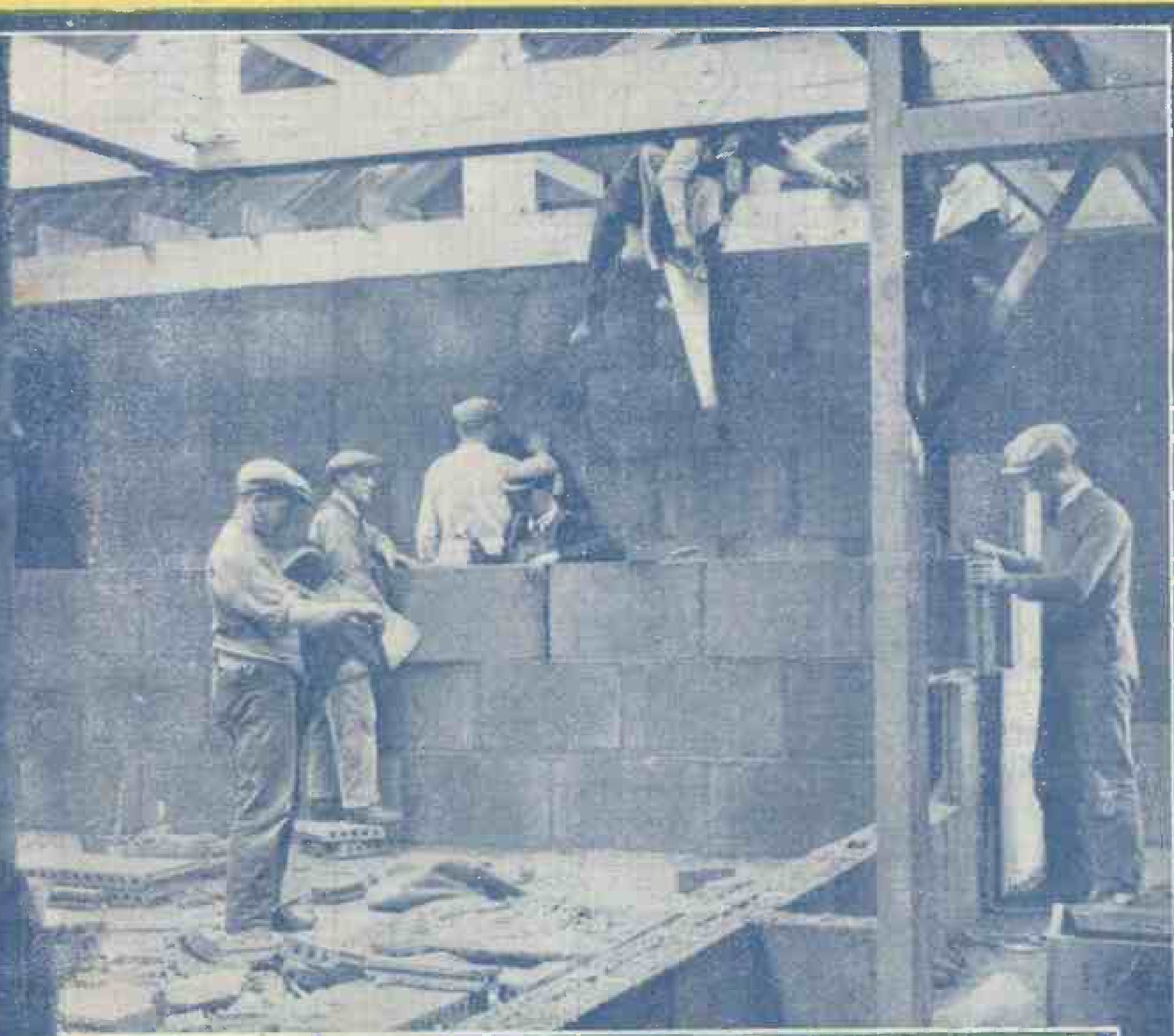
Popular Wireless

Every Thursday
PRICE
3d.

No. 289. Vol. XII.

INCORPORATING "WIRELESS"

December 17th, 1927.



SPECIAL FEATURES IN THIS ISSUE

Light In Our Valves. B.B.C. Personalities of To-Day
The A B C of H.F. Amplification. Adding That Amplifier

Our cover photograph shows the new Belfast studio in the course of construction.

A great little condenser!

THE Dubilier fixed condenser with its di-electric of best India Ruby Mica, is hermetically sealed into its bakelite case to render it absolutely immune from the effects of damp or dust.

Before being sealed, however, the condenser element is subjected to enormous pressure, immersed in boiling wax, and kept so rigidly clamped when assembled that the excluded air can never regain entry.

Finally the excellent bakelite moulding acts as an extremely high resistance and prevents losses through current "creeping" across between the terminals.

Years of experience and specialised craftmanship go to the making of this great little condenser; see that it figures prominently in every set you build.

Dubilier Mica Condensers.
Types 610 and 620 (vertical):
0.00005 to 0.0009 mfd., 2/6
0.001 to 0.006 mfd., 3/-
0.007 to 0.009 mfd., 3/6
0.01 mfd., 4/-
0.015 mfd., 4/6

CATALOGUE AND PRICE LIST SEPTEMBER 1927
DUBILIER

All Dubilier Products are fully described in the catalogue shown here. In addition there is a lot of information which you may find interesting. If your dealer has run out of copies we will forward you one free.

DUBILIER
REGISTERED DUBILIER TRADE MARK

DUBILIER DICTA

No. 4.

Truly we progress in cycles.

What must have been the first wireless set to be used on active service had an aerial consisting of paraffin tin cans propped up on bottles.

The mighty spans of aerial covering acres of ground and supported on masts over eight hundred feet high connote the peak of the curve, and we are already descending again via the modern directional aerial of increasingly diminutive proportions.

* * *

If this sort of thing spreads to receiver practice we may soon expect to be building the "Coheret five" of the "Maggie Super eight."

* * *

When the small accumulator was sold mostly for running trembler coils on cars, perhaps it was legitimate to rate it at double its actual capacity. Now, when we want an accumulator for valve lighting, we are careful to see that the capacity is rated in terms of continuous, not intermittent, discharge.

* * *

There is another little matter in which it will pay you to exercise a spot of circumspection.

It concerns the practice of referring to Mansbridge Condensers in terms of their "test" voltages.

* * *

You *may* be perfectly safe in working a Paper Condenser at half its stated test voltage; on the other hand you may find that it deteriorates rapidly at considerably less than this figure. It all depends upon what is meant by the word "test."

* * *

But after all, "test" voltages are things that mainly concern the manufacturer.

What *you* are interested in is the maximum voltage at which your Mansbridge will work in safety to itself and to your set or battery eliminator.

* * *

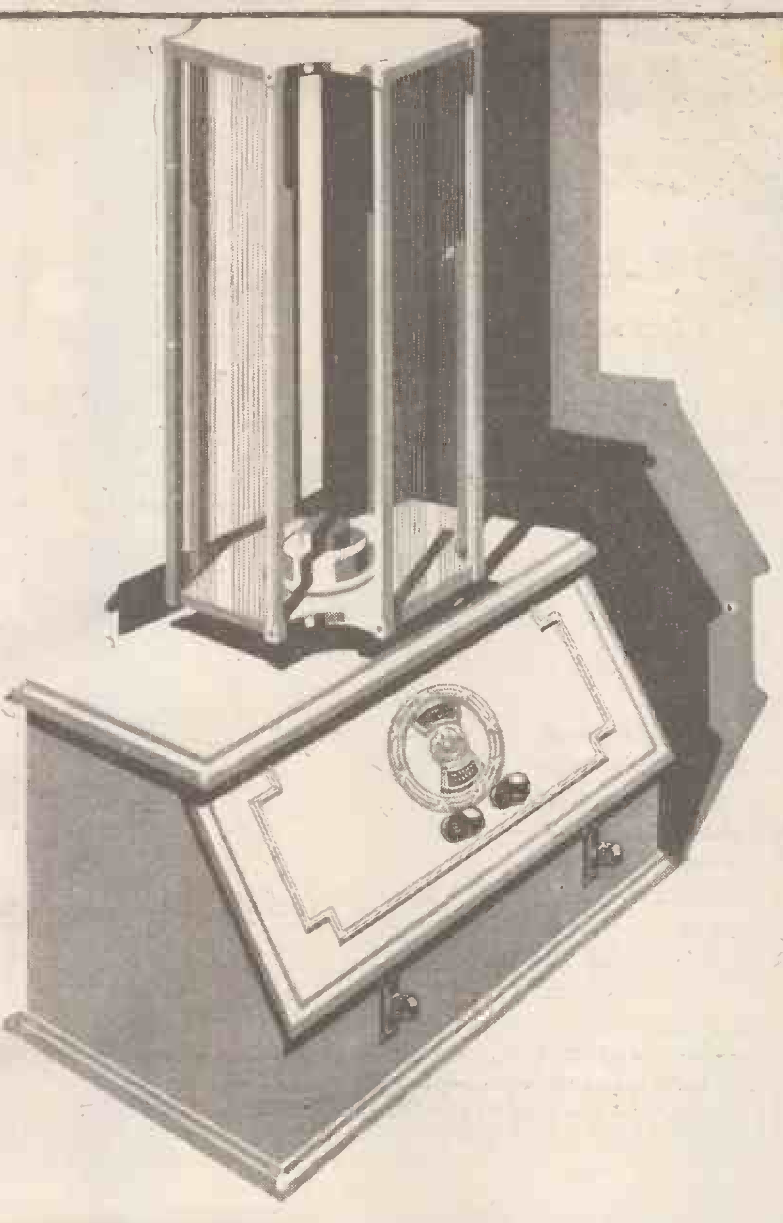
Turn to the Mansbridge Condenser section of our catalogue (pp. 9 to 12) and you will find that for your convenience all condensers are referred to in terms of their safe working voltages.

* * *

Advt. of The Dubilier Condenser Co. (1925) Ltd., Ducon Works, North Acton, London, W.3.

T.C.87.

MARCONIPHONE



From the immense Marconiphone organisation comes a stream of inventions, minor as well as major, so that to them falls naturally the lead in wireless evolution.

YOU GET MORE FROM MARCONIPHONE

The Marconiphone Super-Eight (8-valve) receiver comes startlingly near to achieving the impossible ideal of perfection. There is only one Tuning Control and, as you turn it, signals from thousands of miles away are picked up and transformed into powerful crystal-clear tones. Then there is the convenience of the Power Control (which you operate from your chair) and a host of other refinements which make the Super-Eight the most perfect of all receivers. May we send you our booklet No. 438? Receiver only, £53 0 0 (Royalty £6 5 0)

DEFERRED PAYMENTS.

Marconiphone "Super Eight" Receiving Set, Complete with Valves, Batteries, Leads and Sterling Type 33 Loud Speaker, Royalty Paid, may be obtained on a first payment of £7 16s. 9d., and twelve monthly payments of £6 3s. 5d. Full particulars on request.

The Marconiphone Company, Ltd., 210—212, Tottenham Court Road, W.1.

A Present that Speaks

The Cabinet £6. 6s.

The H.Q. £6.

The Mascot £4. 10s.

NOT only on Christmas Day, but every day of the coming year, the Brown Loud Speaker you give will speak your good wishes. Often, during the months that are yet to come, will the recipient of your gift hear expressed in the sweet music of the Brown, the kind thoughts which prompted the giving. Again and again will he thank you for the rich treasure that you have made his. For the priceless boon of pure and undefiled Music. For the bringing to his home of all that is best in the World's Literature and Speech. For the rich tonic of Humour. And only those who have heard the Brown know how the uncanny realism of its reproduction makes one and all *live*.

Here we show three of the many types of Brown Loud Speakers. Your Dealer will be proud to let you hear these and others. From 30/- to £15. 15s.

Brown

LOUD SPEAKER

S. G. BROWN, LTD.,

Western Avenue, North Acton, London, W. 3.
Showrooms; 19, Mortimer Street, W. 1;
13, Moorfields, Liverpool; 67, High Street,
Southampton; Wholesale Depots throughout
the Country.

1184

AN APOLOGY

Owing to the abnormal demand for NEW R.C. THREESOME COUPLING UNITS

which, commencing at the Radio Exhibition, far exceeded all anticipations, many constructors have not yet been able to obtain these components.

The disappointment which must have been felt by so many people, and the inconvenience which may have been experienced, is much regretted.

Superhuman efforts in manufacture have now placed us in a position to cope with the demand for Coupling Units and your dealer should have ample supplies now.

If any difficulty is experienced in obtaining these units, write and tell us the name of your dealer.

EDISWAN

VALVES

Clearest, Strongest
Last the Longest

P. W.

To THE EDISON SWAN ELECTRIC CO., LTD.
(Publicity), 123/5, Queen Victoria St., London, E.C.4.

Please send, post free, presentation copies of the New R.C. Threesome Instruction Book and Blue Print.

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Ashley Radio

JACKS

PLUGS

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RESISTANCES

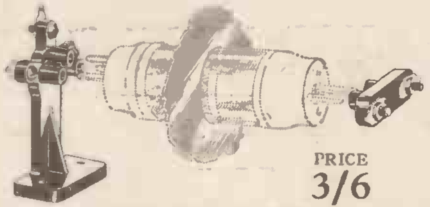
R.C.C. UNITS

VALVE HOLDERS

LOUD SPEAKERS

MULTIPLE FIXED CONDENSERS ETC.

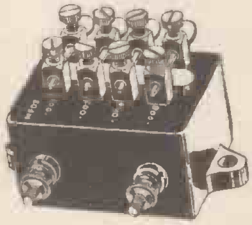
SCREENED-VALVE HOLDER



PRICE 3/6

Conveniently made in two pieces, enabling the valve to be inserted or extracted at will. Fitted with Terminals and Soldering Tags. GENUINE BAKELITE.

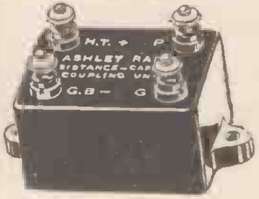
MULTIPLE FIXED CONDENSERS



Although cheap enough to be incorporated permanently their main function is to determine the correct capacity of fixed condenser required in any specific circuit. Two ranges of capacity are made and capacities varying from ·0001 to ·0015 are obtainable in steps of ·0001 and similar variations are to be obtained with the second unit the minimum capacity of which is ·001. The acme of neatness and efficiency

PRICE 5/6

Resistance Capacity Coupling Unit. (A & B)



Made to suit the valves now marketed for R.C. circuits it is a first rate example of what can be accomplished by a careful study of up-to-date requirements in every direction. So far as can be determined it represents the best ideas in practice, the more remarkable in consideration of its compactness. The "A" unit suits all valves the impedance of which is less than 40,000 ohms and is recommended especially for the detector stage. For valves with an impedance value of over 40,000 ohms the "B" unit can be most effectively used.

PRICE 5/6 each.

If your dealer cannot supply, we send post free.

ASHLEY WIRELESS TELEPHONE CO. (1925) LTD.,
Finch Place, London Road,
LIVERPOOL.

all Guaranteed Components

Be sure to see *this* mark on all COLOURED CONNECTING WIRE

THE LONDON ELECTRIC WIRE COMPANY AND SMITHS LTD · REGISTERED · LEW

This LEW trade mark on the label guarantees that it is the original GLAZITE coloured connecting wire. Since its introduction, hundreds of thousands of home constructors have proved the advantages of GLAZITE. It makes wiring simpler, quicker, more efficient and cheaper. Always wire your sets with GLAZITE Coloured Connecting Wire. But be sure it is genuine—insist on the LEW trade mark.

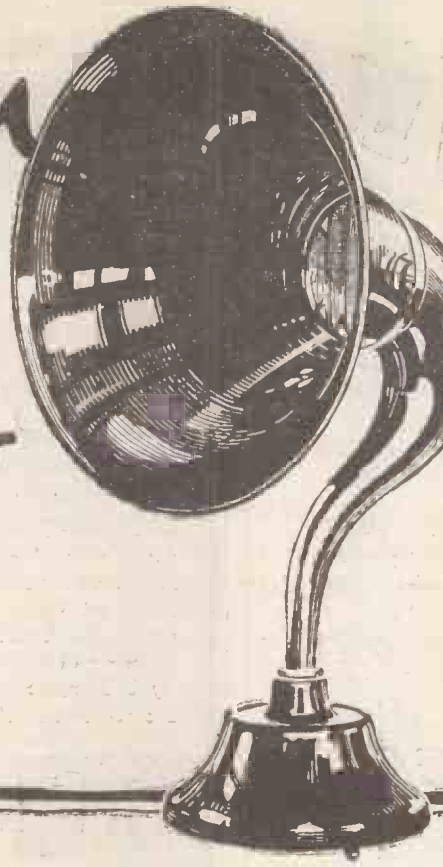
Made in Red, Blue, Green, Yellow, Black and White. Price: 10d. per 10-ft. coil, 9d. per packet of four 2-ft. lengths (Assorted Colours).

The
LONDON ELECTRIC
WIRE CO. & SMITHS LTD.
Playhouse Yard, Golden Lane, E.C.2.

GLAZITE
BRITISH MADE REGD.

THE *ORIGINAL*
COLOURED CONNECTING WIRE

Reduction in price



WE have pleasure in announcing that the price of the B.T.H. Type C2 Loud Speaker has been reduced from £3 0 0 to

£2-10-0

The loud speaker itself will remain unchanged and will still be in the future, as it has been in the past, the finest instrument of its kind and class. Give a B.T.H. Loud Speaker this Christmas and you give a present that is sure to please.

The above price is applicable in Great Britain and Northern Ireland only.

B T-H

LOUD SPEAKER

TYPE C 2

The British Thomson-Houston Co. Ltd.

2881

Where men meet

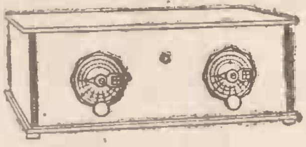
AT THE CLUB *you'll hear them say "I've just built a Cossor 'Melody Maker.' It's an amazing Set. Picked up eight Stations last night. Beautifully clear. So simple to use."*

ON THE GOLF COURSE—*"Yes, I built my Cossor 'Melody Maker' in one evening. The chart showed me exactly what to do. No soldering was necessary. By building it myself I saved over £5."*

IN THE TRAIN *"There's nothing to beat a Cossor 'Melody Maker.' I can always be sure of getting at least six different programmes any evening. Such perfect music, too—no one would want anything better."*

free

Apply to your Dealer at once for a free copy of the large chart "How to build the Cossor 'Melody Maker'." Nothing quite like it has ever been published before. Soldering eliminated. Every wire shown individually bent to shape and numbered. As easy to build as Meccano. Success guaranteed. If your dealer cannot supply send postcard to A. C. Cossor Ltd., Highbury Grove, London, N.5.



The Cossor "Melody Maker"

The sensation of the season. Never before such an amazing response from the public. Many dealers report waiting lists of customers wanting to buy Cossor "Melody Maker" parts. Costs little to buy—yet gives better performance than many factory-built Sets costing more than twice its price. Gives broadcasting from France, Germany, Holland, Italy, Spain, Switzerland as well as all B.B.C. Alternative Programmes.

You'll hear them talking about the

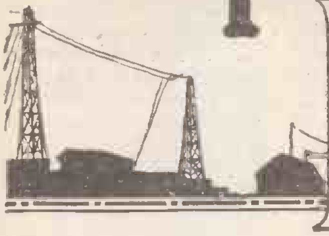
Cossor

"Melody Maker"

Backed by the reputation of Cossor Valves

1177

Popular Wireless



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RADIO NOTES AND NEWS.

The Regional Scheme—Listen for Kootwyk—Covering the Canary—The Australian Stations—This Week's Technical Hint—The "Sydney" Two.

The Regional Scheme.

AS I understand the latest proposals, the B.B.C. is aiming at putting two alternative programmes within range of every crystal set. Some people ask, "Why all this tenderness for crystal users?" The reply is that so long as a person pays his 10s. per annum he is entitled to the fullest possible benefits of the B.B.C.'s service, whether he can afford a valve set or not. The B.B.C. could not possibly take any other view.

What is Progress.

ACCORDING to the "New York Times," Senatore Marconi, during his trip to America in October, said that America had progressed in radio ahead of all other countries. As I know from personal experience that an American reporter will invent a half-column interview if he fails to get the interview, I am not sure what the Senatore said, or if he said anything. But I regret to have to disagree with the alleged statement. What have the Americans which is good in radio that we have not?

Telephony Distress Call.

IF you are listening-in and happen to hear a voice calling "Mayday," do not consult the calendar under the impression that your astronomy is all wrong, or that a gentleman from Colney Hatch has escaped and is announcing that he is "Queen of the May." No, the Radio Conference at Washington has formally adopted the word "Mayday" as the distress call for radio telephony. It is derived from "*M'aidez.*"

Heard in the Street.

FOREMAN (to dullard assistant): "Neow! Not the spanner! *The 'ammer!* Lumme! if there ain't enough blinkin' wood in yore nob to make one of those there blooming wireless 'beams'!"

Mystery of the Voice.

THAT incident of the little invalid girl who begged to be allowed to hear over the ether the cheery and kindly "Good-night, everybody. *Good*-night," of one of 2 L O's announcers is to my mind something of a revelation. I never dreamed that the voice, divorced from the actual presence of the speaker could so deeply affect the listener, especially when transmitted telephonically. I have experienced the *difference* between various voices, some arriving only as intelligible sounds, and others charged with personality, but this incident has a deeper meaning altogether.

Listen for Kootwyk.

THE telephony transmitter at Kootwyk (Holland) is provided with a beam aerial, and experiments have shown that thereby the angle of radiation in the vicinity of the station has been reduced to 30 degrees. Kootwyk sends out messages in French, German, English and Italian every Wednesday between 14 and 15 G.M.T. asking for reports on strength, modulation, and constancy. Take note that the call is P C L L, and the wave 18 metres.

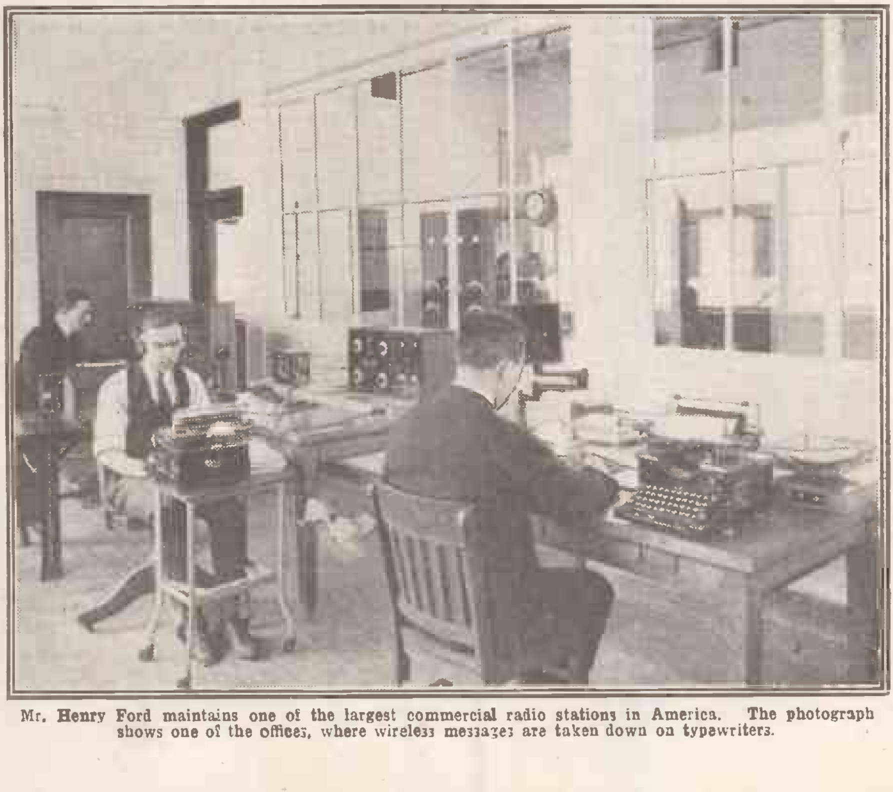
Iceland Calling.

IF you should hear a broadcasting station sending out messages, music and news in English and gibberish, it may be a station in Iceland called Akureyri, which transmits on 192 metres every Saturday from 7 to 8 p.m. G.M.T. The call is N I 2 S H and the gibberish is Icelandic.

High Voltage versus Rubber.

THE deplorable accident to Mr. Miller, who was killed not long ago at the Daventry Station through touching a conductor carrying current at high pressure, raises a serious question. The engineer-in-charge is reported to have stated that the voltage in question was between 5,000 and 9,000, and that rubber gloves would be useless as a protection against such voltages. I thought, at the time, that this was not

(*Continued on next page.*)



Mr. Henry Ford maintains one of the largest commercial radio stations in America. The photograph shows one of the offices, where wireless messages are taken down on typewriters.

NOTES AND NEWS.

(Continued from previous page.)

quite correct, though no contradiction from "P.W." appeared to be called for; but I am glad to see that the India Rubber Manufacturers' Association have now stated publicly that electrical gloves can be made to withstand voltages up to 30,000,

Covering the Canary.

THAT was rather a funny incident last month which took place during a dinner of the National Union of Manufacturers, when the microphone in front of a speaker developed a piercing squeak and stopped the flow of oratory. Then the Home Secretary, who, I suppose, must know about canaries, had the presence of mind to throw a napkin over the instrument, which took the hint and closed down.

Short-Wave Stations.

PORTSMOUTH Signal School, B Z C, 33·5; S.S. Cap Polonic, D C P, 25, 34; Royal Danish Dockyard, D N S C, 47; Mengam, F U E, 38·5; Montenourg, F U M, 37; Rome (Cento Celle), I C D, 63; Chrisimaio, I S T, 38; Tobruk Radio, I C U, 54; Rufisque, O C R U, 39; S.S. Slamat, O L Q, 19, 22·5, 37; Motorliner Gripsholm, S K B, 37·5; Rio de Janeiro, S P W, 29·3, and S P X, 40·5; Buenos Aires, S P 1 (not S P I, as reported); Atlantic Broadcasting Corp., W A B C, 64; Rocky Point (U.S.A.), W B V, 14·09; Newark, N.J., W K C, 17·5, 27·9.

The Australian Stations.

"REGULAR READER" (Deal) writes to say he has intercepted 3 L O (Melbourne) and is mystified as a result. Why should he be mystified when his receiver is the "'P.W.' Every Purpose Two"? Well, now! This is the state of affairs. 2 F C is Sydney, N.S.W., and 3 L O is Melbourne. The first sends on 32 metres and the second on 29·8 metres. They are both stations connected with the commercial Beam service, and relay the programmes of the ordinary broadcasting stations at Sydney and Melbourne respectively, using the call-signs of those stations.

Once Upon a Time!

WHEN the dreams of all good B.B.C. uncles come true they will materialise into the sort of palace which houses the National Broadcasting Company of New York City. The palace wonderful has only a mere fifteen stories! This is a wretched hovel, of course. It has guest reception rooms, cloak-room, smoke-rooms, and all sorts of other rooms. The area of the thirteenth floor is about 13,000 sq. ft., and contains five studios, foyer, artistes' reception room, and main control room. The foyer has a resilient cork-tile floor, light-green walls and polychromed and acoustically-treated ceiling. Gee! There are dressing-rooms and shower-baths for the staff, and in the largest studio (40 x 80 ft.) is an auditorium for 250 people.

This Week's Technical Hint.

DEAR old "Reynolds'" for November 27th tells its wireless readers that if the acid of an accumulator has a specific gravity of less than 1·250 there will be a "fallacious reading on the hydrometer." Evidently, then, your hydrometer must be trained to register a specific gravity of 1·250—I like the 0—and nothing else. But why should the hydrometer go wrong just because the acid does? These experts are too profound for poor old Ariel

New Light.

A FELLOW-SUFFERER, who gives a Monomark BM/GEL, writes sobbingly about chamber music, and states his opinion that it might not be so bad if it were not "controlled" so much. He says that he has heard chamber music from Continental stations, whose "control" operators had either less zeal or more discretion. I commend this to Mr. Jefferies—if he is still "controlling" at 2 L O.

SHORT WAVES.

"Who owns the air?" asks a headline. We don't know; Mussolini hasn't told us yet.—"Everybody's Weekly."

* * *

TOO MANY TUNING DIALS.

Neighbour: "How many controls are there on your radio set?"

Owner: "Three; my mother-in-law, my wife and my daughter."

* * *

Somebody is always taking the joy out of life. The short waves now used by amateurs carry as well in the daytime as at night, and there is no longer any excuse for staying up till morning.

* * *

Bobby: "You shouldn't whistle while you're building a wireless set, you know.

Radio Fan: "Why not, young man?"

Bobby: Well, daddy whistled when he was building ours, and now it whistles all the time."

* * *

QUITE ENOUGH.

There are no heating appliances in the majority of broadcasting studios.

We understand that the wireless lectures supply the hot air.

* * *

A thought for to-day: The wheels of the Postmaster-General grind slowly, but they grind exceeding "fine."

* * *

LUCKY HUSBAND.

"Oh, Charley," sobs the young bride; "it's awful! I was right in the middle of making a fine cake and listening to the radio set when the valves burned out, and I couldn't hear the rest of the recipe. What shall I do?"

* * *

"If you wish to please your parrot let him listen in," we read in a provincial newspaper.

We do not, however, recommend this in many cases; most parrots know enough bad language already.

A Commercial Hint.

THIS is the age of advertisement, yet apart from the series of cigarette pictures which dealt with radio terms, I do not think commercial people in general have taken half the advantage they might of the craze for radio. For instance, the makers of Players' Navy Cut cigarettes have introduced for Christmas a specially "posh" container, ornamented, and so forth. Very nice, but what about packing "fags" in a small loud speaker, or enclosing a small radio component in every box of one hundred?

5 I T's "Close Downs."

CERTAIN poetry-like lines which have been read by Mr. Percy Edgar from 5 I T are now published in a lump for half-a-crown. I am not quite sure why. I am not an expert on poetry, though I have read a lot of it and believe that I have a fairly accurate nose for the real stuff. The authoress of the book, to wit, Ida Mary Downing, knows a lot of words, but fails to give one a happy, magic moment. Too much Silence, Bells, Passion, Love, Tragedy! All the words of real poets, but no inspiration or new thoughts. Sorry! Possibly 5 I T listeners may like to "blue" half-a-crown on the book for auld lang syne.

N U—6 H M.

BY the way, the amateur station 6 H M—a photograph of which appeared on page 639, "P.W." No. 286—is not a British-owned transmitter, as was stated. The full call-sign is N U—6 H M, and the owner and operator is Colonel C. Foster, of Carmel, California, U.S.A.

"Modern Wireless."

THE Christmas Number of this leading wireless monthly is a "bumper." Why not, if you have any love for "P.W." treat yourself to a copy as a Christmas present? Thereafter you will not wish to miss it—though I really cannot imagine a "P.W." reader who does not already subscribe. It is a big thing, and will fill your mind with new ideas and your bosom with new ambitions. This is an exclusive "Ariel" tip. Cut out the monthly bob's-worth of sob stories and come into the "M.W." gang!

Another Rectification Method.

H. H. P. (Westerham), for whose letter we thank him heartily, says that he has been trying out a different method of rectification, with pleasing results. He abolishes the usual grid leak and condenser in favour of an L.F. transformer, whose secondary is connected in series with the grid leak and the ·0005 condenser which is placed across the A.T. coil. He comments on the clarity of reproduction obtained. This is an interesting variant, but, as Mr. Dowding tells me, not a new one, as it appears in a number of American circuits.

Worth Hearing.

DECEMBER 16th.—"Sambo and the Forty Thieves"; all Scottish stations. December 17th.—Running commentary on Scotland v. Waratahs match; all Scottish stations. December 18th.—Symphony concert, 2 L O. December 19th.—Orchestral concert from Grosvenor Hall: Belfast. December 21st.—A. J. Alan, short story, 2 L O. Ah! and on December 17th, a brass band contest arranged by the Newcastle Station and relayed from the Town Hall. Test piece: "The White Rider."

The "Sydney" Two.

THIS set seems to have hit the bull's-eye first shot. It *eats* short-wave stations, and many readers who made it up early are now sitting up late. F. G. B. (Greenwich, S.E.) says he is surprised at the ease of control which is equal to that obtainable on 500 metres.

Work on One Valve.

THAT "'P.W.' Inexpensive One-Valver" is a little gem—a Rolls-Royce on the chassis of a—a Showitt Seven. J. H. (Weymouth) made it, and in one evening logged the two Daventrys, Paris, Hilversum, Langenberg, Hamburg, Vienna, Glasgow, Plymouth, and eight other foreign stations including Barcelona. Why use a crystal?

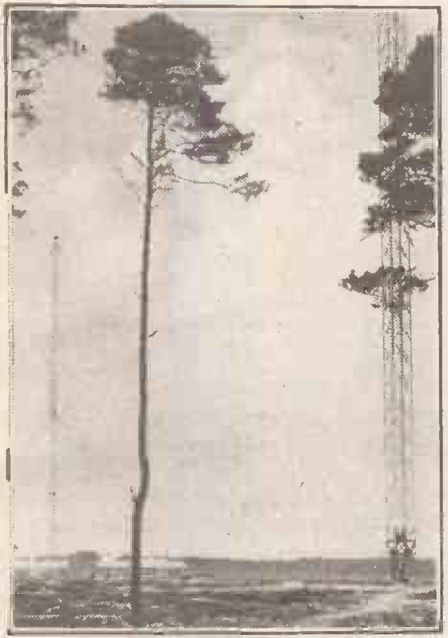
ARIEL.

ZEESEN

Germany's Latest High-Power Broadcasting Station.

By Dr. ALFRED GRADENWITZ.

THERE have been three distinct stages in the development of German broadcasting. During the first two years all efforts were made towards one end—that of providing as far as possible a transmitter in each of the nine transmitting districts into which the country had been divided. The output of each of these transmitters was ·7 kw., this type being then available as a handy makeshift.



A general view of the aerial system and the station building.

It was, of course, realised that this power would be insufficient to supply all the various places uniformly, but at the same time plans were made to replace the transmitters of the principal localities by more powerful units.

Increase in Power.

The second stage was therefore characterised by an increase of radiating energy in connection with new transmitters, individual outputs being raised to 6 times, and the useful aerial height to 2–3 times the former figures, thus corresponding to about 25 times the former amount of radiated energy. This, however, entailed the provision of masts 250-350 ft. high to carry the aerials.

New transmitters were therefore installed at distances of a few miles from centres of inhabited areas. Finally, during the third stage, the erection of what could be described as high-power transmitters was commenced. These comprise the Langenberg (Rhineland) transmitter and the powerful plant now under construction near Koenigswusterhausen, which is to take the place of the old "Germany" transmitter.

It is thus to be substituted for the old Koenigswusterhausen transmitter familiar to many radio listeners, and is being installed in the neighbourhood of Zeesen, a small locality near Koenigswusterhausen. Messrs. Telefunken were, in October, 1926, entrusted by the German Postal and Telegraph Department with the design and construction of the plant, and an experimental service is now being commenced.

The station building is a hall, adjoining which there has been erected a front building of quite modern design. The hall comprises the service rooms—studio, rectifier room, engine room, amplifier room, battery room, measuring room, workshop, stores, heating plant, etc. In the front building, which comprises two stores, there are the offices, another amplifier and battery room, a small studio and two spacious flats for the staff of the station. Another small building has been erected in the immediate neighbourhood to accommodate the cooling plant of the transmitter tubes.

1,250 metres.

The transmitter has been designed on the separately-controlled valve-transmitter principle with intermediate circuit, and is likely to be fitted also with a tertiary circuit. It is arranged for an operating wave-length of 1,250 metres, though there is a possibility of variation over a range of 100 metres.

The transmitter comprises three stages, the modulating transmitter, the intermediate amplifier and the output amplifier. The anode tension of 10,000 volts for the three stages is derived from one high vacuum rectifier arrangement which, through an H.T. transformer is operated direct from the three-phase current system.

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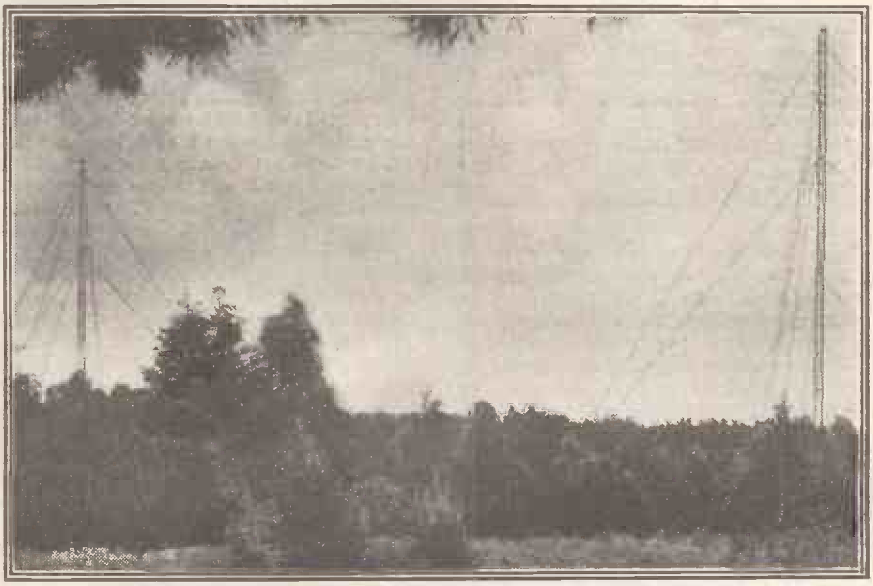


The Zeesen station is situated in remarkably beautiful surroundings.

PROTECTING THE FILAMENT.

A Simple Device which May Save You Pounds.

By G. T. WATSON.

IN the days of the bright-emitter valve consuming ·75 amp. it was a wise policy to insure the filament against high tension burn-out by placing an ordinary flash-lamp bulb in series with the negative H.T. lead; but with the modern valve, taking as low a current as ·06 amp., such a device affords little protection.

Several current-limiting devices and fuses will suggest themselves. Let us assume that the filament current must not exceed ·06 amp. A resistance of 800 ohms, such as a 220-volt 30-watt lamp, placed in the negative H.T. lead would only allow ·06 amp. to pass in the event of a 120-volt battery being shorted to the filament circuit, and the valves would not be overrun. But this resistance, in addition to reducing the value of the anode voltage, would probably result in a bad low-frequency howl because of the coupling effects produced in the anode circuits.

Easily Devised Fuse.

It would seem, therefore, that the ideal protective device should be of low ohmic resistance, and non-inductive. The difficulty is to get a slender enough "fuse" to blow at such low currents. Few amateurs possess a steady enough hand to cut tin foil down to the requisite thickness, and material must be sought elsewhere.

Under normal conditions the filament of a 220-volt 30-watt lamp passes about ·125 amp. If, however, we break the glass of the lamp and destroy its vacuum, then the carrying capacity of the filament drops enormously. By breaking one of these lamps open it is easy to obtain a dozen short lengths of filament. Lamps which have been discarded with broken filaments make excellent sources for filament fuse wire.

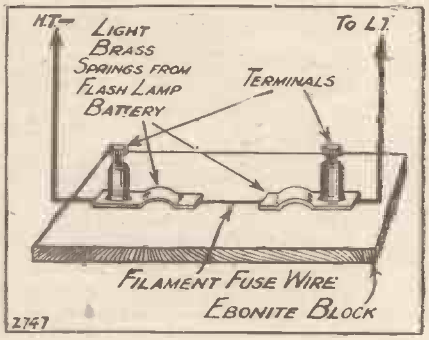
The wire will be found to be brittle and requires careful handling. A convenient mount has been found to take the form as shown.

With reasonable care the wire can be slipped under the light springy brass holders, and its insertion is no harder than that of an ordinary domestic fuse. Spare fuses are easy to obtain, easy to renew, and cost practically nothing. The 30-watt type of filament under ordinary atmospheric conditions will blow with about 50 milliamps, a convenient figure, allowing ample H.T. even for a multi-valve set, and yet falling below the ·06 of the lightest dull-emitter filament.

No Coupling Effect.

Such a fuse has, of course, no coupling effect, since its valve will not be more than 20 ohms, and has no external field to give complications in the rest of the circuit. Its great value to the experimenter is that he can depend on the fuse blowing always at a fixed current value, since lamp filaments do not vary in carrying capacity to any appreciable extent.

Various fusing points can be obtained by inserting two or more lengths of the fuse wire under the springy brass holders in parallel. It may be found convenient to mount several pairs of holders on an ebonite strip, and thus place a fuse in the anode supply to every valve. Such a device is particularly useful to the experimenter, whether he works with a battery eliminator, with dry batteries, or H.T. accumulators.



The special mooring arrangements of the bracing cables for the lattice masts.

ZEESEN.

(Continued from previous page.)

The first transmitter stage generates oscillations which are amplified and modulated in the second stage, being eventually supplied to the third stage and there raised to the required strength. Special connections have been provided to prevent any feed-back to the preceding stage.

Similar to Langenberg.

The transmitter comprises the following valves: Twelve water-cooled high vacuum rectifier valves, one 1 kw. valve (first stage), one water-cooled 10 kw. valve (second stage), six 20 kw. valves arranged in parallel (third stage), three modulating valves, and one rectifier valve for generating the grid bias for the modulating valves.

The rectifier valves, the output valves of the third stage and the modulating valves are heated by means of transformers operating from the 6,000-volt three-phase system, the H.T. being at first reduced to 400 volts. The 400-volt alternating current is eventually used to feed the heating transformers proper.

The cooling-water consumption of all valves works out at about 10 cubic metres per hour, with an initial pressure of about 3 atmospheres. The difference of temperatures between the admitted and discharged cooling water should not exceed about 10 degrees.

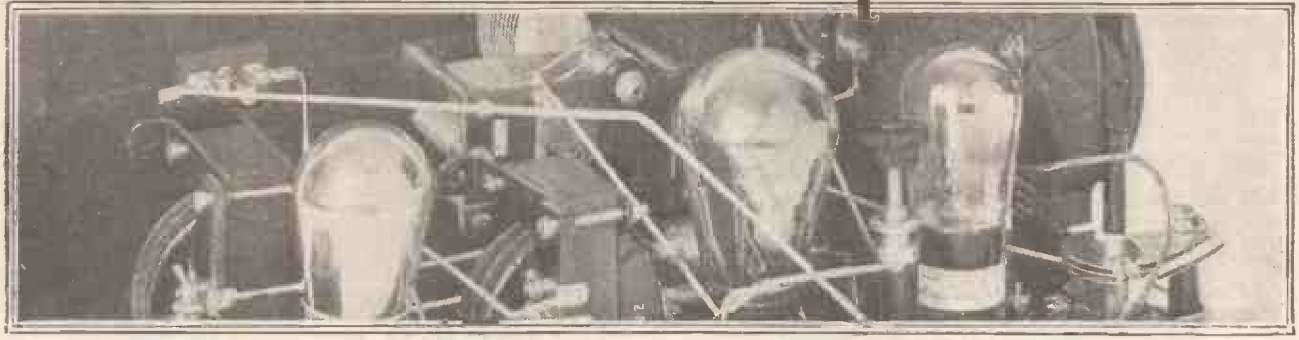
The terminal amplifier and the measuring instruments of the modulating plant have been combined with the transmitter proper, and have a similar arrangement of connections to that of the Langenberg transmitter.

The Aerial System.

Two insulated wire-braced iron frame masts, 700 ft. long, have been installed at distances of 1,500 ft. apart to carry the antenna. A T-aerial about 1,000 ft. long and 20 ft. wide has been provided to serve as aerial; this has a capacity of about 3,500 cm., and a characteristic wave of about 2,300 metres. These dimensions have been chosen in order that the contemplated mode of operation with a wave of 1,250 metres may correspond to about ·6 times the characteristic wave, thus ensuring a radiation resistance as large as possible.

A small-meshed earth network about 2,500 ft. long and 1,000 ft. wide dug into the ground is used as earth conductor network; this is rounded off in a semicircle at each of its wide sides.

The A B C of H.F. Amplification



This easy-to-understand article is the second of a Series for the Beginner, and deals with PART 2: INSTABILITY.

By G. P. KENDALL, B.Sc.

IN my last article I mentioned that certain high-frequency circuits were more stable than others. although I did not enter into details and explain exactly what I meant by "stability," and this may have been a little puzzling to the beginner who has been assuming that a high-frequency valve is simply something which amplifies the signals at high frequency, and does nothing else.

Actually, we come at this point to one of the most difficult problems of high-frequency amplification, one, moreover, which affects practically every receiver ever built which includes high-frequency valves. It arises from the very important fact that a high-frequency valve of the ordinary type has a strong tendency to oscillate, and will actually do so in the great majority of cases unless special precautions are taken to stop it. or unless the receiver is such an inefficient type as to "hold it down" by means of heavy losses at some point or other.

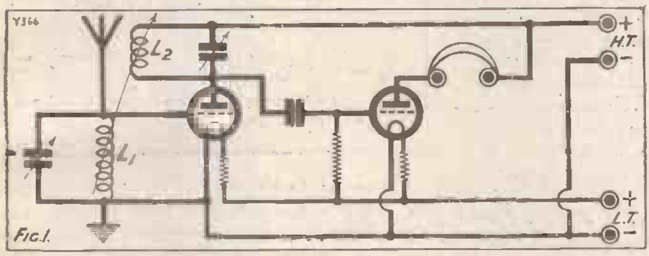


Fig. 1.

Why It Oscillates.

Let us now see why it is that a high-frequency valve has this tendency to self-oscillation. Taking, for the sake of simplicity, a tuned-anode circuit once more as being one of the easiest to understand in a general way, we may suppose that the anode coil is coupled magnetically to the aerial coil, as shown in Fig. 1. It will be seen at once that we have here, so far as the first valve is concerned, something very much like the single valve reaction circuit with which the reader is already familiar, and it will be understood at once that if the coupling between the two coils is made sufficiently tight the valve will be thrown into self-oscillation, and proper reception of telephony will become impossible.

Now, the first point to notice in this connection is that high-frequency valves oscillate much more easily than simple detectors, because there are very much stronger high-frequency currents flowing in the tuned-anode circuit than are normally present in the reaction coil in the case of a single-valve circuit. Thus, very much weaker coupling between the two coils will be sufficient to cause self-oscillation.

It will, therefore, be easily understood that it is quite possible, unless we are careful in our lay-out, the two coils may be placed in such a way that there will be enough stray coupling between them to cause quite a strong tendency to oscillate even though we have not deliberately coupled them together. This was, at one time, one of the main difficulties in constructing an efficient tuned-anode set, and very considerable pains had to be taken to reduce such stray coupling as far as possible.

In a carefully laid out set, of course, this trouble of interaction between coils can be reduced very largely, and even eliminated, by the use of special coils and more particularly of screening, and the same applies in a large measure to interaction between wiring and so on, but there is unfortunately another cause of instability in high-frequency circuits which is not by any means so easily dealt with. The reader will have realised that anything which tends to feed energy back from the anode to the grid circuit produces a tendency to instability, and if a sufficient quantity of energy is fed back will produce actual self-oscillation, various deliberate methods of introducing such effects being used in different schemes

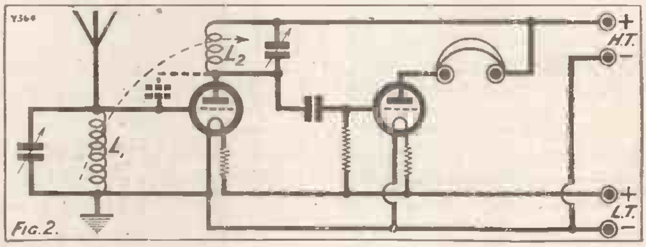


Fig. 2.

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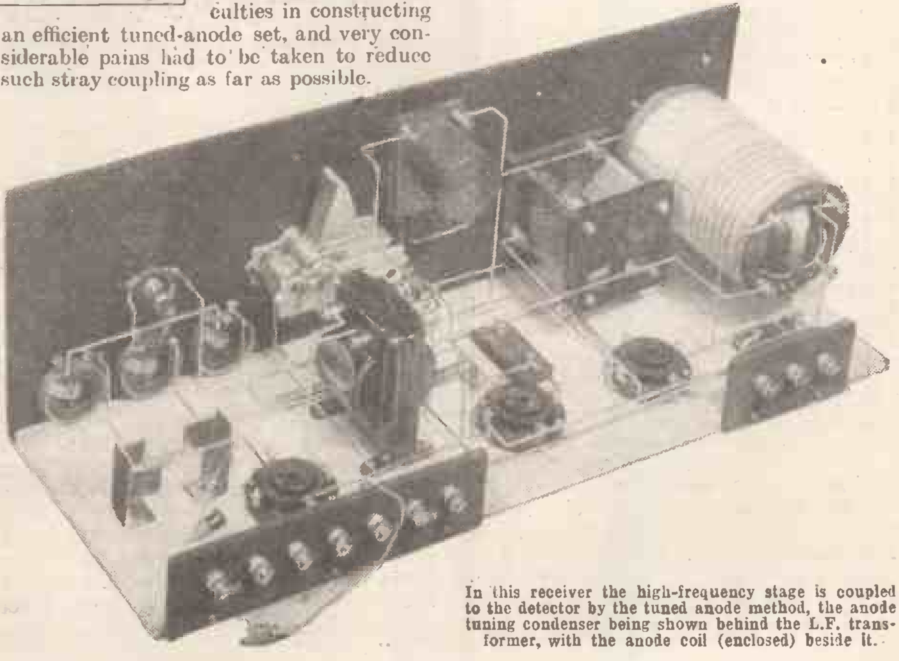


In this receiver the high-frequency stage is coupled to the detector by the tuned anode method, the anode tuning condenser being shown behind the L.F. transformer, with the anode coil (enclosed) beside it.

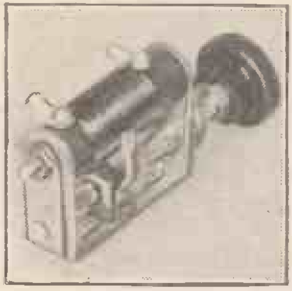
THE A.B.C OF H.F AMPLIFICATION.

(Continued from previous page.)

for producing reaction. Now, one of these methods of producing what we may call "feed-back" for brevity's sake, is to connect a condenser directly between plate and grid, and this used to be done at one time in some types of sets as a method of obtaining reaction.

Internal Capacity.

Such capacity feed-back may well be present in many receivers between various wires and components, and although this can be reduced by carefully spacing the wiring, etc., unfortunately it is also present actually inside the valve. The trouble is that in the ordinary valve there is a capacity between plate and grid, these two electrodes forming the equivalent of two plates of a small condenser. Although this capacity is really very small, it may on occasion be large enough to feed back a sufficient amount of energy to make the valve oscillate, and in the more modern and more efficient type of high-frequency valve, in particular, this is quite a real danger.

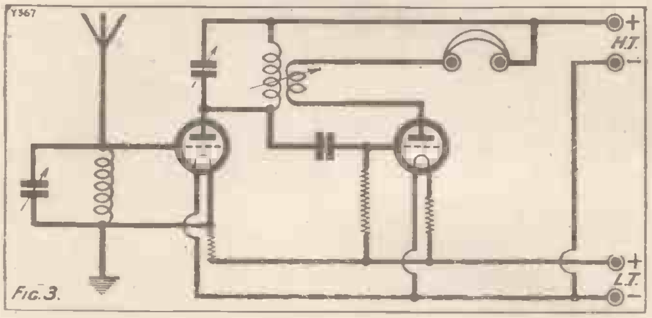

The practical form of the potentiometer, shown theoretically in Fig. 4. The voltage on the grid will vary according to the position of the slide.

Early Valves.

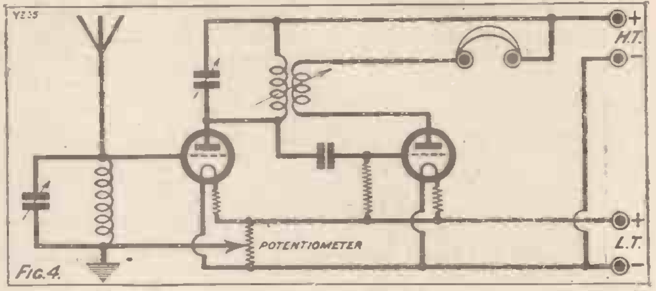
These two possible sources of feed-back in a high-frequency valve and its circuit are indicated in Fig. 2, where a dotted arrow between the coils represents the possible stray coupling between them, and the dotted condenser between plate and grid indicates what is called the inter-electrode capacity.

In the earlier days of the use of high-frequency amplification, the tendency to oscillate produced by feed-back was not nearly so serious as it is to-day, and it was very often sufficient to see that there was not too much stray coupling between the coils to ensure that the receiver would be reasonably stable.

This was partly because the high-frequency valves used in those days were very much less efficient than the modern ones, giving less amplification, so that the amplified signals flowing in the anode circuit were not nearly so strong in proportion to those in the grid circuit, and hence the danger of feed-back was naturally less.



Furthermore, the ill-effects of the plate-to-grid capacity were not so pronounced, because the electrodes of the valves themselves were relatively small, and further the space between plate and grid might be considerably larger, again reducing the capacity.



Again, it was usual in those days to use a simple aerial circuit consisting of a coil and condenser in parallel, or sometimes in series, and this was rather useful in stabilising the receiver, for the aerial circuit is usually quite a high-resistance one, with high damping which prevents it from being thrown into oscillation at all easily. Thus, quite a considerable amount of feed-back could take place without actually making the set oscillate, and, indeed, it was often necessary to add a certain amount of reaction to bring the set up to its most sensitive condition.

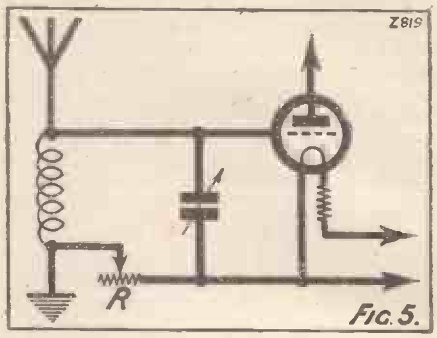
Reaction.

This was often done by coupling the anode coil to the aerial coil, as in Fig. 1; although it was soon found that this was not at all an efficient scheme, since the slightest variation of coupling between the coils caused considerable alterations in the adjustments of the tuned circuits, besides giving a very sudden and fierce control of reaction. Much better results, it was soon found, could be obtained by breaking the anode circuit of the detector valve and inserting a reaction coil here in the ordinary way, which was coupled back to the aerial.

The development of receiving circuits in general very soon led us to start using more selective aerial tuning arrangements, and the plain type of tuned circuit began to decline in popularity. Instead, more selective arrangements with some scheme of inductive or auto-coupling to the aerial, with a tuned secondary circuit across which the high-frequency valve was connected, began to be used, and with these the instability difficulty became very much more acute since more selective circuits were naturally more lightly damped, and were, therefore, much more liable to go into oscillation. Self-oscillation of high-frequency valves became a very real factor, and the better our circuits became the more awkward it was, so that a great deal of attention had to be paid to methods of stabilisation.

Obviously, one simple way of stabilising a circuit tending to oscillate was to introduce losses at some point or other, so that the energy which was fed back could be absorbed before it got a chance to make the receiver oscillate. One very simple way of doing this was to apply a certain amount of positive bias upon the grid of the high-frequency valve, which had the effect of producing grid current in the tuned circuit, damping it so considerably that in most cases it stabilised the valve.

Such a positive bias could be quite easily obtained by taking the lower end of the tuned circuit to the positive end of the filament instead of the usual connection at the negative end, as we see in Fig. 3. This positive bias scheme was quite effective in preventing self-oscillation, but it was found that it damped the receiving circuit rather heavily and flattened out tuning a great deal; it also reduced the amplification obtainable. When it was used it was customary to apply the reaction to the tuned anode circuit, since it was found that distinctly better results could be obtained in this way than by reacting on the aerial circuit. This is also shown in Fig. 3.



Since the damping produced by applying the full positive potential from the positive end of the filament was rather excessive for most purposes, and led to rather poor selectivity, another scheme often used was to employ a potentiometer connected up as in Fig. 4, where it will be seen that the lower end of the tuned circuit is taken to the slider of the potentiometer, so that it is possible to apply either the usual zero potential to the grid of the valve by placing the slider at the negative end, or any amount of positive bias up to the full potential of the positive end.

Losser Methods.

Distinctly better results were obtainable in this way, but even so, a good deal of efficiency was lost by the use of any damping method of this sort, since it was obvious that by introducing such losses the circuit was merely artificially held down by its own inefficiency.

Before leaving the subject of these "losser" methods of stabilisation, it may be remarked that another form often used, and which has certain recommendations, is the insertion of a variable resistance in series with the tuned circuit, as shown in Fig. 5.

Light in Our Valves

How to Avoid a Dark Christmas.

By K. D. ROGERS.

A FEW more days and it will be Christmas—that festival of good spirit, comradeship and happy laughter. A time of general holiday, and general oscillation, too. But it is not of laughter or oscillation that I want to speak, though possibly both may depend to a certain extent upon my words. Rather is it of the few days preceding the 25th that I wish to talk, days of preparation, of eager looking forward, of feverish effort to "get the new set ready in time," of anticipation, bustle everywhere, at business, at the shops and at home.

Watch the Batteries.

And in that bustle we forget. Yes, it is always the case, the most important, though perhaps apparently less obvious, points slip our memories, and later on we find ourselves "in the cart."

Aunt Betty's present is forgotten, we find we have given Uncle George the same as we did last year, and last, but by no means least, we forget that general overhaul of the set and omit to have our batteries recharged.

For in these days of dull emitters, when no perceptible glow emanates from our valves we forget the L.T. is running down until we turn on the set on Boxing Day for the early evening's fun—and the little lights in our valves fade more or less slowly away. And this year is to have two "Boxing Days," for a Bank Holiday is ordered for the Tuesday, and we have three whole days to go without a chance of getting a new H.T. or rejuvenating our juice supply. What a disaster! And yet it is so easily avoidable.

General Overhaul.

So, I would advise all of you to do as I shall do. Run over the H.T. and L.T. and grid-bias supply very carefully, about three days before Christmas. If the H.T. is more than 20 per cent below its proper voltage—with the set having been in operation for at least half an hour—in the case of a dry battery—I should get a new one, *in case.* If the H.T. supply is of the accumulator type, have it recharged if the time period of holding its charge is approaching its end, whether the battery has dropped voltage or not. Should it have dropped voltage ever so slightly it were best that it were recharged.

The L.T. should have the same test, though I think that, unless it has only just been recharged and "can't possibly run down," it should be charged specially for the holiday programmes. There's nothing like making sure.

The grid-bias battery should be up to voltage or else it *may* give trouble—and that ends the battery problem.

But there are other little points that it is just as well to watch. Those H.T. leads, for instance. All those bits of wire, flex perhaps, frayed at the edges and put on the terminals anyhow, with match sticks for wander plugs at their business ends—scrap them! Get fresh leads or overhaul them, and use wander plugs and spade terminals; it's best and it's safer.

It may save you 10/6, 14/-, 21/-, or many pounds, for a doubtful flex may short with the next one, slip off its terminal and get on to the next, pop out of the H.T. battery and make rotten contact and cause crackling noises; and the L.T. positive lead from the accumulator may—if placed near the H.T.—slip off and decide to have a look at one of the H.T. wander plug sockets. Result: brilliant but transitory illumination in the valves, very pretty but very costly, and then—silence!

Senatore Marconi at the microphone of W C D A, the New York station that never sends out jazz!

Clean up those dirty plug-in contacts, valve legs, coil pins, and have another look at the aerial—possibly the first after its erection months or years ago—to see if it is still there, and is likely to remain there.

And especially have a look at those internal connections, see that no bits of wire, grid-bias leads, etc., are hanging about inside and just waiting an opportunity to cause a firework display. Remember it's December 25th, not November 5th, and those of you who have screened valves must also remember you have two H.T.+ for each screened valve to go a-wandering, so keep an eye on them.

You'll want a valve or two as stand-by's in case of accident, but if you have these, don't be reckless with the others. Tend them carefully and they will last you well.

Then, having everything O.K., be careful on the fateful day not to over-run your valves. If grandma can't hear those carols very well add another valve, and shift the old soul nearer the spout of the speaker; don't try to increase signal strength by turning up the filaments—it's bad for the valves. You may increase their lighting capacity, but you'll decrease their lives, and the result may be a "general depression centering round everybody" on the next night when you find the valve emission has gone west.

Those Distant Stations.

Reaction will bring up those weak signals to a certain point, but don't push it too far, or your next door neighbour will give up listening in and will start his gramophone (old type), or even his pianola. Just imagine it! And finally, on the night of nights when all the relations are sitting tight waiting for the fun to begin, don't forget to switch on not only the L.T. and H.T., but also the aerial. It makes such a difference and may save your reputation as a constructor of "P.W." sets. And start with the local station. If you promise them America or Sydney you may not be able to fulfil your promise; in fact it's ten to one against your doing so, if you mention your intentions beforehand. Just let those distant stations come in by accident, as it were; it's far more impressive, and if you don't get them—well, what does it matter?

THE RADIO AMATEUR.

America and Great Britain—A Contrast.

By **THE EDITOR.**

A LITTLE booklet entitled "What is Amateur Radio?" has been sent to me by the Secretary-Editor of the Radio Society of Great Britain, and I have read it with considerable interest.

The intentions of this booklet, and of those who produced it, are obviously of the best—namely, the desire to increase the membership of the R.S.G.B. and to enhance the prestige of amateur radio in this country.

But although the R.S.G.B. has these and other admirable objectives in view, and although I am sure that the policy of the R.S.G.B. as a whole is dictated by a sincere desire to serve the interests of the radio amateur, recent events in connection with the Washington Conference compel a careful analysis of the *modus operandi* of the society in its attempts to act as an organised body on behalf of British Amateurs.

As I have explained in previous articles, the society did not send a representative to the Washington Conference because the Post Office assured the committee that it was not necessary and that the P.O. delegates would do all that was necessary in the interests of the British amateur.

The P.M.G.'s Monopoly.

The result, as we all know, was a lamentable display of ignorance by the P.O. delegates, and the unsatisfactory expedient of two American amateurs representing British amateurs was eventually adopted.

The editorial explanation of this state of affairs, as published in the T. & R. Bulletin, makes it clear that the British amateur was not invited to participate in the conference at Washington, and the editorial makes it still clearer that British radio legislation as it now stands does not permit the amateur experimenter any control in the administration of the ether.

That control is vested entirely in the Postmaster-General, who in turn appears to be greatly influenced by the views of the W.T. Board, which is composed of representatives of all Government departments who make use of wireless communication.

At the Mercy of Officialdom.

There can be no doubt that this state of affairs leaves the British amateur in a very precarious and unsatisfactory position.

From time to time the R.S.G.B. makes representations to the P.M.G. on behalf of the amateur, but in nine cases out of ten those representations are made chiefly on behalf of the amateur transmitter.

Sometimes concessions are gained, sometimes not. More often than not, let it be said, what is gained may be likened to scraps from the rich man's table.

The British amateur has to put up with what the P.M.G. and the W.T. Board think good and sufficient. There is little cooperation and, obviously, little real concern in the ranks of officialdom for the amateur.

It is grudgingly recognised by officialdom that a few amateur transmitters and experimenters, when relegated to the shorter wave-lengths, did good experimental work and collected much data of value in connection with short-wave, low-power long-distance communication; but the fact remains that the members of the W.T. Board do not regard the amateur movement as of vital importance, and the liaison and good feeling engendered by close co-operation and sympathetic working existing between American officialdom and the American Amateur Movement scarcely exists in this country at all.

Amateurs in this country are, to put it bluntly, at the mercy of officialdom. In America officialdom "puts its foot down" no doubt—but it looks very carefully first to see where it puts its foot; if it doesn't the American equivalent of the R.S.G.B., representing a large and united body of amateurs and exercising no mean influence, squeals, and squeals with often very satisfactory results.

But in Great Britain officialdom can light-heartedly put its foot down where and when it pleases. It controls the ether; what it says "goes," and if the amateur doesn't like it he can lump it.

If he's very good and politely requests officialdom to "have a heart," officialdom magnanimously and often condescendingly grants a few unimportant favours.

More Members Wanted.

But officialdom over here is absolutely top-dog, and the amateur has no means of exercising any real influence. He has a mouthpiece in the R.S.G.B. That is necessary—and the R.S.G.B., as far as lies in its power, does its job, and exercises its limited functions, satisfactorily.

But it should also act as a lever. It does not. It cannot. The reason? It has not the strength. It has in this country approximately 1,200 radio experimenters on its books. It should have many times more.

In a future article I will suggest why this figure should be possible and why it has not been attained up to the present.

Mr. Gerald Marcuse, the well-known transmitting amateur, operating his gear during one of his recent successful relays. On this particular occasion he handed on the Armistice Remembrance Festival Broadcast to the Empire and, although he used only 1 kw. of power, his station, 2 N M, was heard and appreciated at points as far distant as Bombay.

THE PROGRESSIVE THREE

If you have not built the previous "Progressive" sets there is no reason why you should not construct this week's three-valver, although it is better first to get the previous two stages working individually. But the novel scheme, as you will see, is surprisingly elastic.

By G. V. DOWDING, Grad.I.E.E.
(Technical Editor.)

YOU must not attempt this third stage in the construction of the four-valve set until you are fully satisfied that you are getting really efficient results from the two-valve arrangement. The whole object of this step-by-step receiver is to obtain maximum efficiency from every one of its sections. It is only two or three weeks since I commenced the series and it is possible that you have only just completed the second stage. If this is the case, do not attempt to keep pace with these articles, but carefully place them aside and devote plenty of time to each step forward.

THE EXTRA COMPONENTS YOU WILL NEED.

- 1 Low-frequency transformer (any good make such as B.I., Ferranti, etc.).
- 1 Valve holder (Lotus, Benjamin, Lissen, etc.)
- 1 Baseboard-mounting filament resistance.
- Terminals, wire, etc. (See Text before purchasing the new components.)

The actual construction of a receiver is only half the battle: subsequently you must learn how to handle it properly. And you should wait until you are able to handle the two-valve arrangement so that you can bring in stations easily and in fair numbers on telephone receivers before you even think about adding a stage of L.F. amplification. Anyway, I will assume that by the time you are ready to do this that you have thoroughly mastered the tuning controls and are fully conversant with the capabilities and limitations of the previous two stages.

Will Work Loud Speaker.

I now propose to deal with the addition of one stage of transformer-coupled audio-frequency amplification. You will appreciate that this will not increase the range of reception of the receiver to any considerable extent, but will magnify the strength of existing stations received. A station that gives fairly good telephone receiver signals on the two valves should be brought up in strength sufficiently to enable a medium-sized loud speaker to be operated.

The primary winding of a low-frequency transformer will take the place of the telephone receivers and the energy from the detector valve will be passed through this and transferred to the secondary winding of the transformer. This last passes the energy on to the grid of the third valve which amplifies it and hands it on to the loud speaker or telephone receivers in a considerably magnified form. I hope you will be able to follow this simple series of operations in the theoretical circuit.

"G. Bias" is short for Grid-Bias Battery. A small battery is inserted between the two small points so marked in order to give the grid of the third valve a certain voltage bias, the value of which will depend upon the valve used.

You will require but three additional components for this low-frequency stage. The valve holder should match the other two valve holders in order to preserve a certain degree of uniformity, but the additional filament resistor that will be needed can be of a different make and type from the original one, as it is not placed in a particularly symmetrical manner on the baseboard. This filament resistor should be of the variable type and should be capable of providing a maximum resistance of at least 15 ohms.

False Economy.

The low-frequency inter-valve transformer is, perhaps, the most important item we have yet employed in this receiver, and upon its efficiency will depend, to a very great extent, the quality of reproduction given by the set. It will not be worth your while to economise at this point. Buy the best transformer that you can afford. A nice heavy one carrying a reputable name. Regard with suspicion any transformer that

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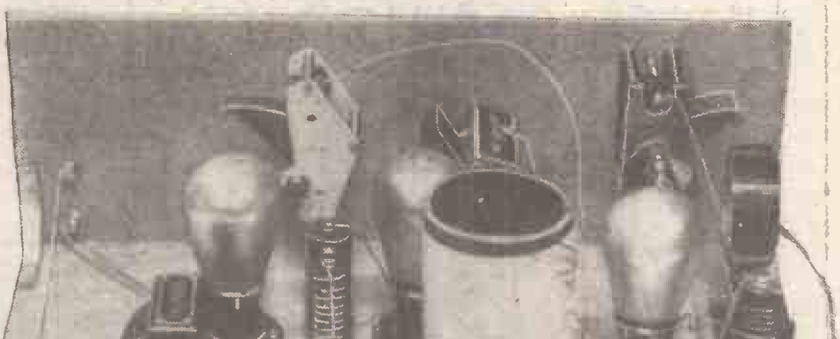


The baseboard, as you will see, is beginning to fill up. The set is now capable of bringing in distant stations on the loud speaker.

THE PROGRESSIVE THREE.

(Continued from previous page.)

weighs anything under a pound or so and is not much larger than an eggcup in size. Bulkiness in a low-frequency transformer can almost be regarded as a virtue! You have a wide variety of excellent transformers to choose from, including such notables as the R. I. & Varley, the Brandes, the Ferranti, the Ediswan, the Marconiphone, the Pye, etc., etc. I used a Gecophone, and found it to be well up to the exacting standard I set for such a component.

Spacing of Components.

The low-frequency transformer should have a ratio of 3½ to 1 or 4 to 1, and will cost you just above or just below a pound. Any one of the makes mentioned is well worth its money, and will be the equivalent in value to half-a-dozen cheap foreign transformers, even if all the virtues of every one of these made could be embodied in one article. It has been said that a good transformer is worth an extra valve, and certainly a good transformer suitably employed can hold its own against even R.C. coupling at its best.

Now you will notice, as progress is made with this receiver, that the baseboard begins to fill up. At the high-frequency end plenty of separation between components was allowed, and this is very necessary; but at the low-frequency end everything can be closed up much more compactly, as the bugbear of interaction

(Continued on next page.)

WIRING INSTRUCTIONS

Disconnect lead number (9) from H.T.+ terminal and join it to plate socket of third (new) valve holder (9).

Disconnect lead number (10) from 'phone terminal and join it to "A" of low-frequency transformer.

Now proceed with the new leads.

Join one filament socket of new valve holder to one terminal of new filament resistor (29).

Join other filament socket of new valve holder to filament socket of detector-valve holder, which is connected to L.T.− (30). (This is the same as taking lead direct to L.T. minus in effect.)

Join G.B. terminal (secondary winding) of low-frequency transformer to G.B.−1 terminal (31).

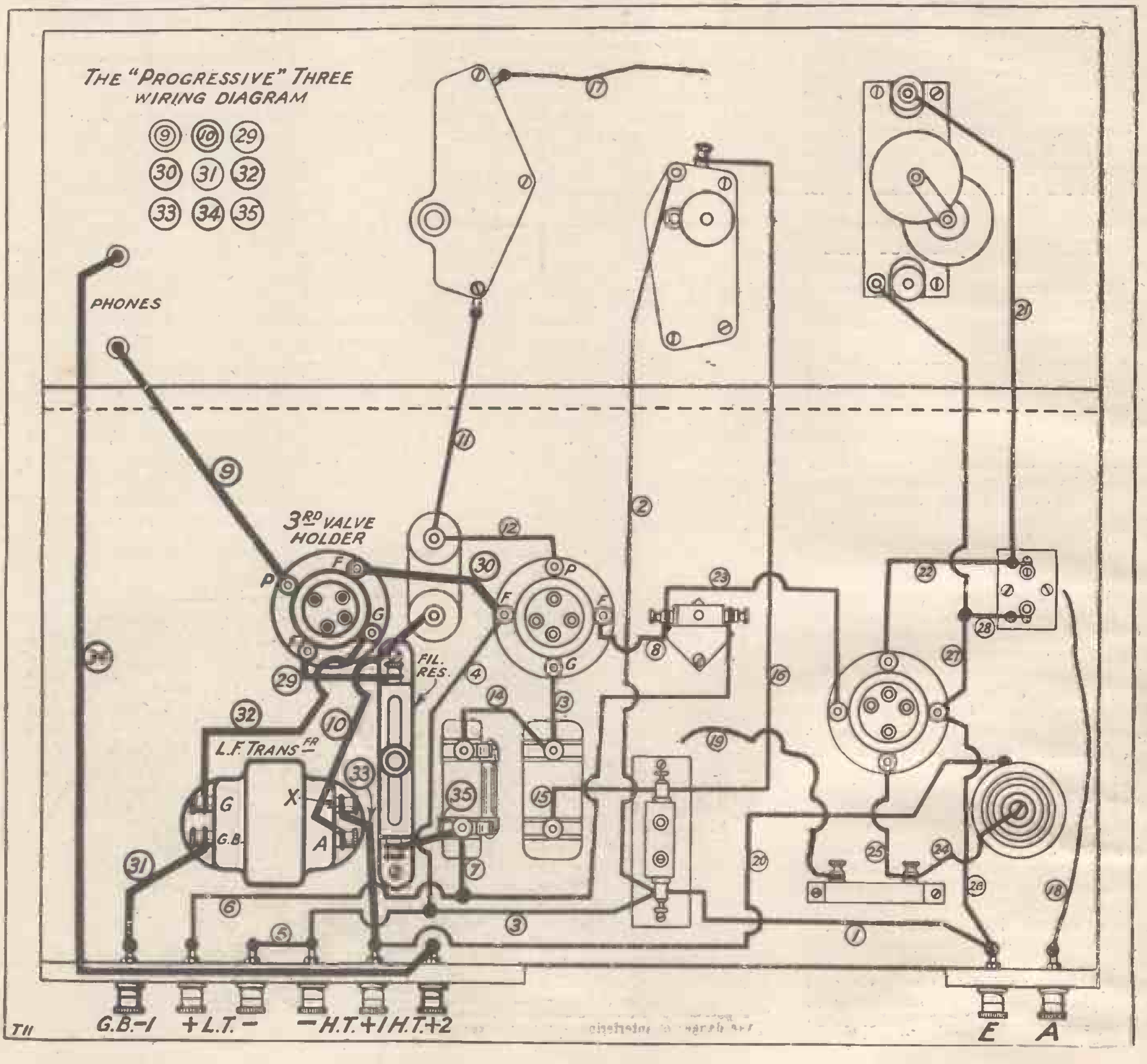
Join "G" terminal (secondary winding) of low-frequency transformer to grid socket of new valve holder (32).

Join "X" (primary winding) terminal of low-frequency transformer to H.T.+1 terminal (33).

Join H.T.+2 terminal to one 'phone terminal (34).

Join remaining terminal of new filament resistor to terminal of grid leak which is connected directly to the L.T.+ terminal (35). (This is same in effect as taking lead direct to L.T.+.)

There are now 35 leads in all.

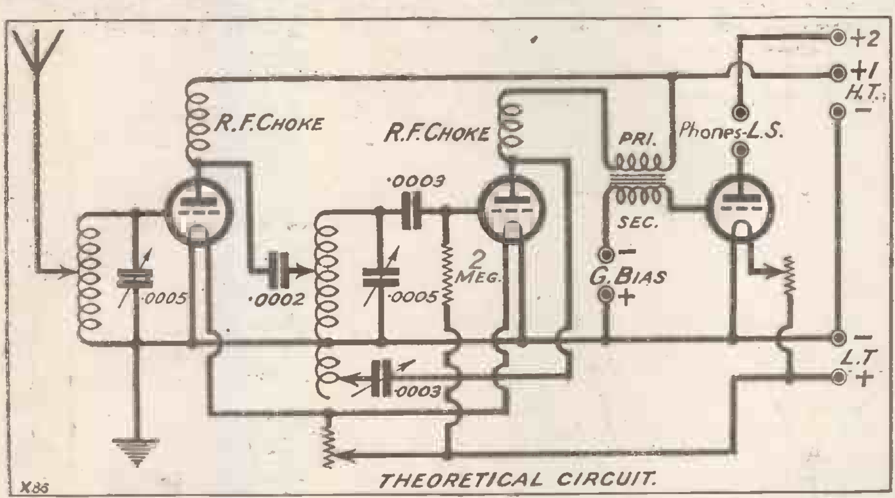


THE PROGRESSIVE THREE.

(Continued from previous page.)

will not be so much in evidence here. Therefore, as you mount these three components remember that space must be left for yet another stage, although, with care, you will find that there will be no necessity for undue crowding. Have a glance at the photographs and notice the space I have allotted for the final group of components. If you leave as much space as that all will be well.

Lay out your three new components as closely as possible in the manner shown in these photographs, and remember that as you approach the end of the task every quarter of an inch in space becomes increasingly valuable if you would avoid really cramping the fourth stage when you come to it.



THEORETICAL CIRCUIT.

Take a careful note of the position I have given to the transformer. You will see that its terminals become nicely placed for the wiring. The transformer you purchase, if it is not a Gecophone, may have differently marked terminals. On the Gecophone the primary winding terminals are “ + ” and “ A.” The “ + ” stands for H.T. positive for it is to an H.T. positive terminal to which it is connected. The “ A ” means “ Anode ” or Plate, and this terminal is connected to the plate terminal of the detector-valve holder through the H.F. choke. These two terminals, “ + ” and “ A,” may be shown as IP or OP or by abbreviations appropriately indicating any one of the above terms.

Two New Terminals.

The secondary-winding terminals are shown as “ G ” and “ F ” and the former goes to the grid of the third valve, and the latter to the Grid-Bias minus 1 terminal.

Additionally to the three components you will require two more terminals, one being added at each end of the terminal strip. If your terminal strip already carries its full eight terminals it merely means that you will have to bring two more of them into use.

One of these terminals will be known as the “ H.T. + 2 ” terminal, the original H.T.+ terminal now becoming the H.T.+1. The second new terminal can be marked G.B.−1, and more will be said as to its use later on.

Having mounted the new components and terminals the wiring can be tackled. This you will find to be a most simple task, as it involves but the alteration of two of the original leads, and the addition of merely seven new leads. Now you will begin to appreciate my new wiring scheme I hope, and will find the wiring instructions and the wiring diagram fully explanatory. On the top left-hand corner of this latter two of the original numbers are shown in double-ringed circles, and the numbers of the new leads are enclosed within single ringed circles. Do not forget to run your pencil through these numbers as the leads concerned are dealt with.

The Additional Wiring.

Both leads Nos. 9 and 10 appear in the previous wiring diagram, but this time they take different routes. No. 9, instead of going from the telephone terminal to the H.T.+ terminal, must now be taken to the plate terminal of the new valve holder. It need only be disconnected at its one end, although if trouble be experienced in making it nice and neat in its new form, it can, of course, be removed altogether and a new piece of wire brought into use. In any case, it can be considerably shortened.

Exactly the same applies to lead No. 10, one end of which can remain joined to the high-frequency choke. Personally, I would prefer to employ new pieces of wire in both cases, but, after all, this is quite a small point. Nothing much need be said about the seven new leads, although, as before, you should keep these well down on the baseboard. Also, you must not forget that further components have yet to be mounted, and lead No. 34 especially should be carefully run with this fact well in mind. It should be carried along the baseboard as far over towards the end of this as possible, and it should be kept parallel with the end of the baseboard and taken at a sharp right angle closely along behind the terminal strip to its terminal. Don't give way to the temptation to run a lead such as this diagonally across, jumping over intervening objects and narrowly escaping causing short circuits at various points along its route.

When you have crossed out the last lead number and have carefully checked the wiring and cleaned the whole job up, you can reconnect the set and give it a test.

You should use a power valve in this third stage. Not a super-power valve, but a power valve of the P.V. (Ediswan), D.E.P. (Marconi or Osram), P.M. (Mullard), or similar type. Such valves are obtainable in all three filament voltages.

The H.T. Battery.

Now H.T.+1 terminal will serve the first two valves as previously, while H.T.+2 terminal will carry the H.T.+ wander plug allotted to the third valve. The same H.T. battery can, of course, be used for all the lot, although it will now be necessary to have two H.T.+ wander plugs, as well as the H.T.− one. The third valve will need about 120 volts for best results, although it will operate fairly satisfactorily with a voltage as low as 75 or so. The exact figure for optimum results will vary with different types of power valves, but the makers always supply with each valve the necessary operating instructions.

You will require a grid-bias battery and, as there is to be yet another valve, I would advise you to obtain one giving a maximum of at least 15 volts, although 9 will be ample for this first low-frequency magnifier. Special grid-bias batteries are obtainable. They are like small H.T. batteries, and

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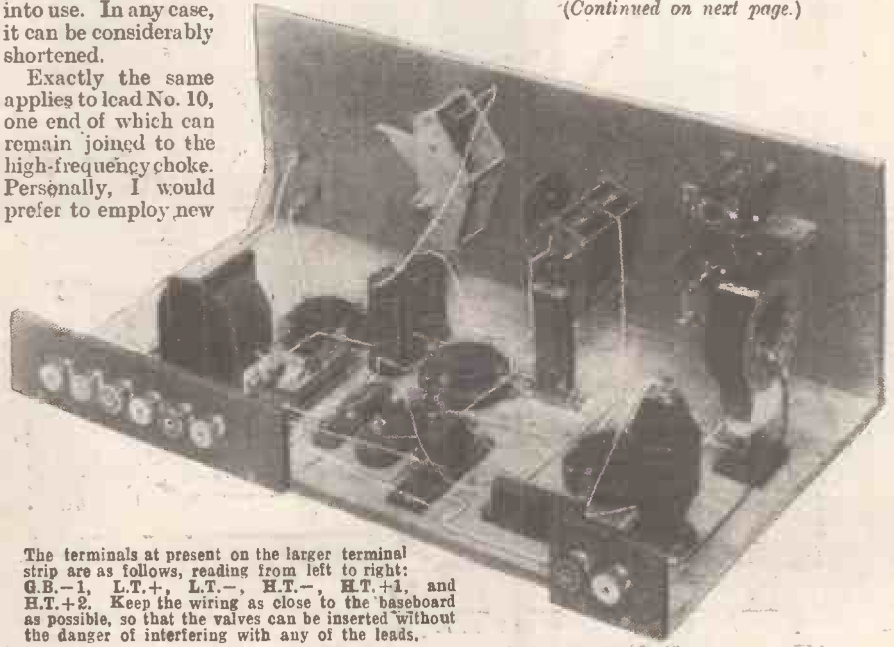


The terminals at present on the larger terminal strip are as follows, reading from left to right: G.B.−1, L.T.+, L.T.−, H.T.−, H.T.+1, and H.T.+2. Keep the wiring as close to the baseboard as possible, so that the valves can be inserted without the danger of interfering with any of the leads.

THE PROGRESSIVE THREE.

(Continued from previous page.)

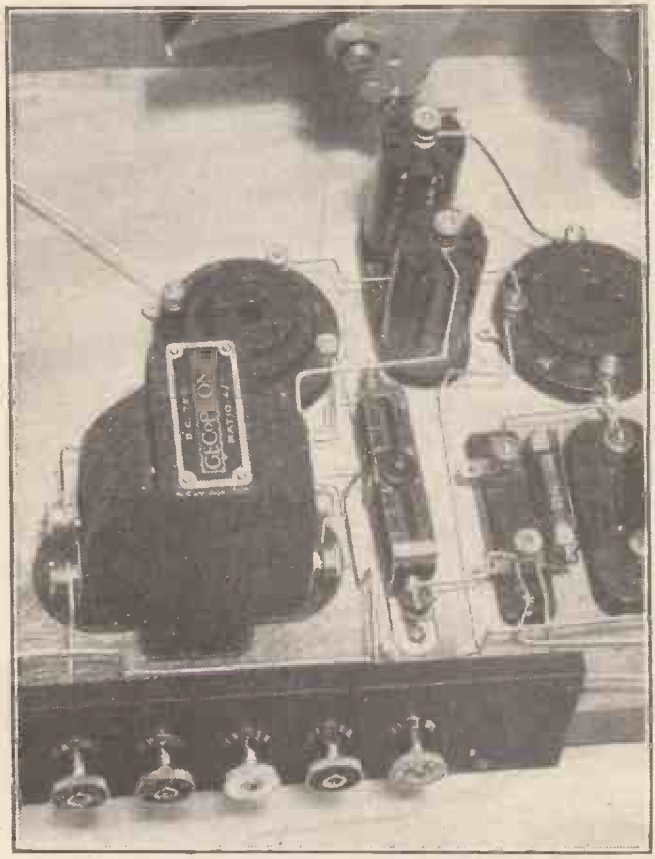
similarly to these are provided with sockets into which ordinary wander plugs can be inserted.

The positive end of the grid-bias battery should be connected to either the L.T. – or the H.T. – terminal. It may be more convenient to connect it to either the L.T. – or H.T. – battery terminal itself, especially if the batteries are to be stowed away beneath a table. Thus, one lead from the batteries to the set can be saved.

The Grid Bias.

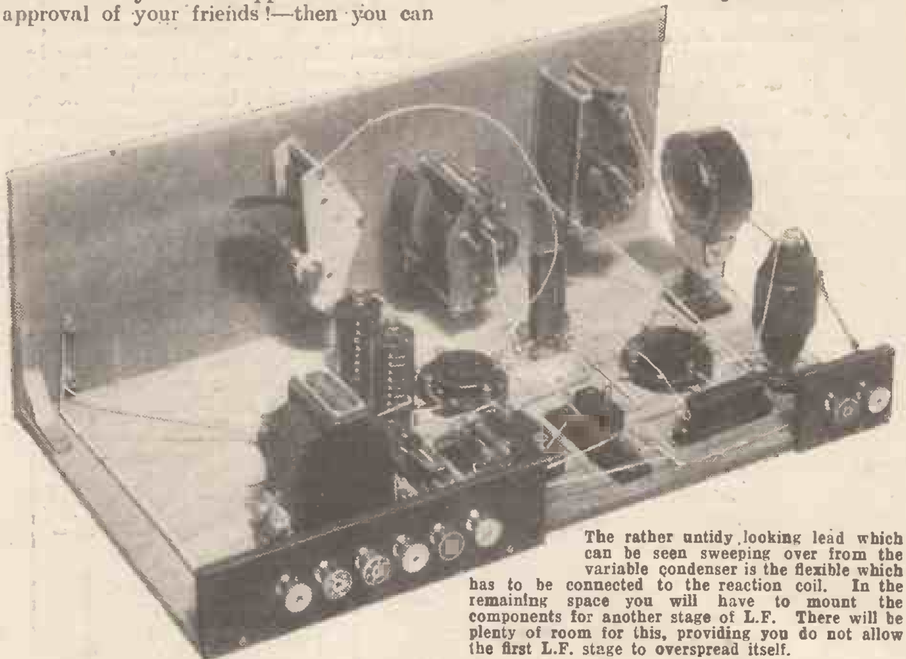
A lead with a wander plug attached to its end should be connected to the G.B. –1 terminal on the set, and this plug should be tapped into the socket of the grid-bias battery, which appears to be most suitable. About 7½ volts will be O.K. for most valves.

I am not anticipating that you will have the slightest trouble in getting good results, providing that you have fairly closely followed my instructions. Some of you may comment on the apparent neglect of fixed condensers and other such "refinements." Of these I will have more to say later on. I am purposely keeping the components down to a minimum in order that there shall be small possibilities of any sort of trouble occurring in these initial stages. Take it from me that you have everything necessary to give you first-class three valve results.



A "close-up" of the additional stage, which forms the subject of the accompanying article.

And when you are able to tune in quite a number of distant stations on the loud speaker, and the reproductions from these meet with your full approval—and the approval of your friends!—then you can begin to get ready for the next step. This will be the addition of a second low-frequency amplifying stage. Perhaps you will be getting everything you require with the three valves. If this does happen to be the case you will be able to jump the next article and wait until I run through the final "polishing-up" instalments. As indicated previously, as a three-valver your set is not yet quite complete, although it includes every essential, and being brought to its present condition step-by-step will probably be more efficient than thousands of four valvers that are giving their owners every satisfaction!



The rather untidy looking lead which can be seen sweeping over from the variable condenser is the flexible which has to be connected to the reaction coil. In the remaining space you will have to mount the components for another stage of L.F. There will be plenty of room for this, providing you do not allow the first L.F. stage to overspread itself.

* *

The above article was written before that detailing the "Progressive" One was published. In fact, as previously stated, the whole scheme was completed and all the necessary diagrams drawn and every photograph taken before the first step was detailed.

By adopting this procedure, it was hoped that every conceivable little "snag" could be eliminated—and I firmly believe that this has actually been the happy result.

But readers will appreciate the fact that points raised cannot, therefore, be dealt with in subsequent articles, but where queries of general interest are raised, these will be dealt with in our Q. and A. columns.

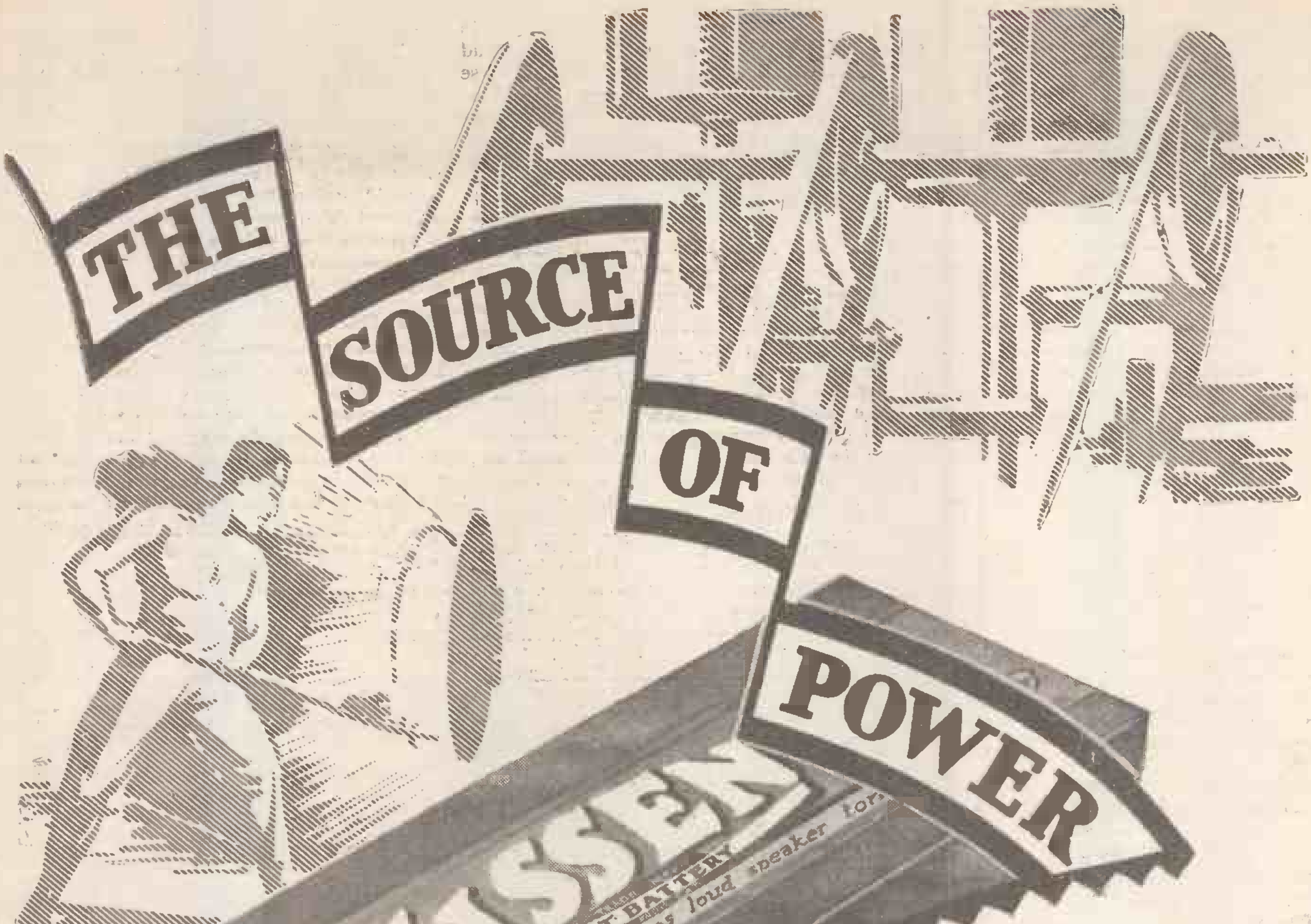
By the way, I note with gratification that a large number of readers have reached the second stage quite safely! Further, no failures to do so have yet been reported, and this is even more satisfactory.

I would like particularly to extend my thanks to P. H., of Ealing and H. A. of Nottingham for their cheery communications respecting "Progressive" One and Two respectively. H. A. is cutting out his local station and bringing in foreigners in a very lively fashion. My great hope is that every "Progressive" constructor is as satisfied as the many who have already written to me.

FLEXIBLE CONNECTIONS.

FLEXIBLE connections to grid-bias and H.T. batteries should be carefully examined at intervals. These are constant causes of trouble, for the flexible wire which will not develop a fault after constant use has yet to be invented. And do not take too much advantage of the flexible nature of flexible wires. Do not subject them to strain or allow them to kink. And keep the grid-bias flexibles well away from all the other wiring.

One of the grid-bias flexible connections will be joined to the L.T. negative and it may so happen that the H.T. negative is taken to L.T. positive. If that grid-bias negative lead is allowed to make a short circuit with any lead in metallic connection with H.T. positive, the full voltage of the H.T. battery will be brought across the filaments of the valves with disastrous consequences. Therefore, you will see that it is necessary to treat the grid-bias negative flexible with consideration, and if you remove the grid-bias battery for any reason do not allow that lead to drop negligently into the interior of the receiver.



Firing a furnace gives you power, but for Radio the power for your valves comes best from the LISSEN NEW PROCESS BATTERY. Upon this your loud speaker depends for its strength and truth of utterance, and its clarity of tone.

The oxygen content of the Lissen Battery is so great that hour after hour your reproduction will go on unimpaired. Throughout the longest programme the Lissen Battery will serve you and stand up unflinchingly to its work. Night after night for month after month it will do this because of the new chemical combination and process used only by LISSEN, because LISSEN alone holds the secret.

(N.B.—The success of this secret process is now so widely recognised that other manufacturers would willingly sacrifice a fortune to possess it.)

You get pure D.C. current always from the LISSEN Battery—strong, sustained, and noiseless in its flow. There are no moving parts to cause a hum, so there is no hum to be eliminated. The LISSEN Battery is safe (no risk to children) and is now so low in price that it is brought within the reach of all.

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60 VOLTS	7/11
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TECHNICAL NOTES By Dr. J. H. T. ROBERTS, F.Inst.P.

SINGLE DIAL CONTROL.

GANG CONDENSERS—EBONITE v. BAKELITE—RADIO VISION, Etc.

Single Dial Control.

THE attention of set designers has long been devoted to the multi-valve receiver with single control. Where only low-frequency amplification is used the problem is comparatively simple, but for distant reception and for selectivity, high-frequency amplification becomes essential (not considering for a moment "super" circuits) and some rather difficult problems have at once to be met.

Taking a circuit with two neutralised high-frequency stages, and including the aerial circuit, we have three separate controls which have to be carefully adjusted in relation to one another for the proper reception of a distant station. If the circuit is to cover long-wave stations, such as Daventry and Hilversum, as well as stations in the ordinary broadcast range, the problem is complicated a little further.

Gang Condensers.

One of the commonest methods of controlling three tuned circuits simultaneously by a single control is to use a "gang" of tuning condensers, that is, in effect, one long condenser divided *electrically* (but not *mechanically*) into three separate condensers, these three condensers controlling the three tuned circuits respectively. For this system, it is, of course, necessary to match the inter-valve circuits by making the inductances, leads, etc., as nearly equal as possible, and by using valves of as nearly as possible the same characteristics. Even then it is usually difficult in practice to obtain satisfactory results over any considerable range of wave-length, although the arrangement may be excellent over a limited wave-length range.

Logarithmic Condensers.

More recently condensers have been designed in which the movable vanes are shaped to a specially designed curve in order to compensate for variations in the aerial and inter-valve circuits which are under control.

Switch Tuning.

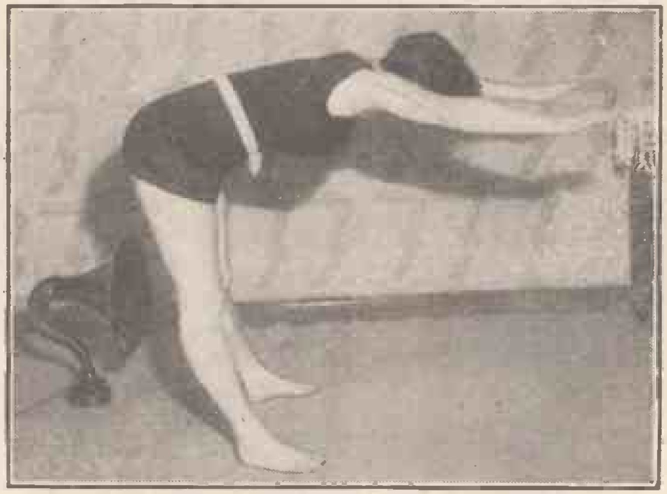
Another arrangement, which has the merit of great simplicity, is to provide various permanently-tuned circuits (which may be obtained by means of tappings or otherwise), and to fit upon the panel of the receiver a number of switches, each switch throwing in a different circuit. If the various receiving circuits are permanently tuned to the wave-lengths of particular broadcast stations, it is evident that all the set user has to do is to close the switch corresponding to the station he wishes to receive, leaving all the other switches open.

This has, as I have already remarked, great attractions for the entirely unskilled user, but it has obvious limitations, in that the set can only receive a comparatively small number of stations. Moreover, in the event of the tuning being thrown out of adjustment for any reason, the correction is a matter involving probably more experience than is required for the operation of a receiver tunable in the usual way.

Sets with "tuning switches" for particular stations, however, are on the market, and show promise of becoming very popular.

Ebonite v. Bakelite.

Although ebonite is much more commonly used in this country than bakelite for radio panels and components, there seems to be an impression, amongst experimenters who have not had experience of bakelite, that this material has numerous advantages over ebonite.



A German lady athlete doing her morning exercises to directions from one of the broadcasting stations.

The fact is that bakelite, which has been very largely used and boosted in the United States, has certain advantages, but, on the other hand, in many respects a good quality of ebonite is to be preferred to bakelite.

In actual breakdown voltage, for example, the best quality of ebonite has been shown to give a figure nearly three times that of bakelite.

Working Advantages.

Bakelite has the advantages that it is very hard (without being brittle), that it stands considerable exposure to sunlight and other influences without deterioration, and that it takes and retains an excellent polish without developing surface leakage. Ebonite, on the other hand, is easier to cut and to drill, although its surface requires to be rather carefully watched, or it is liable to be injured by the influences mentioned above. Ebonite, if exposed to warmth or even in any case with ageing is apt to warp—a drawback which is not experienced with bakelite.

Taking a broad comparison of the two materials, and assuming always that we are considering a good grade of ebonite, it seems that there is not a great deal to choose between them as regards actual service in use, whilst the ebonite is easier to manipulate from the experimenter's point of view.

Incidentally, the two materials are quite different in composition, ebonite being a hard-vulcanised rubber, whilst bakelite is a special synthetic composition into which formaldehyde largely enters.

Radio Vision.

In the current issue of "The Proceedings of the Institute of Radio Engineers" is a very interesting paper by Mr. C. Francis Jenkins, the well-known United States television expert, entitled "Radio Vision." In this paper he gives a very full and interesting account of his early experiments on picture transmission and of the development of his original methods and apparatus for the purposes of what is usually called "television."

It is interesting to note that Jenkins confines the term "television" to the transmission of moving pictures by *wire* and uses the term "radio vision" to describe the transmission of moving pictures by *wireless*. Therefore, what is commonly called "television" in this country would be called "radio vision" by Jenkins. I think this distinction of terms is rather useful, as the word "television" has up to now been used rather loosely to describe the transmission either by wire or radio.

First Experiments.

The following quotation from the article will be interesting to those of my readers who follow the progress of experiments in this subject:

"The art of electrical picture transmission is very old relatively, for more than 50 years ago successful demonstrations were made in sending pictures by wire. And there have been many workers, too, but the attainment of each was given but passing notice until the stamp of approval was put thereon by the great laboratories of the Bell Telephone Company, when, in April last, they made their spectacular demonstration between Washington and New York. This demonstration gave a great impetus to the development of electrical transmission of all kinds of pictorial representation.

"Our first public demonstration of radio vision occurred on June 13th, 1925, when we showed in the laboratory in Washington, in the presence of Navy Secretary Wilber, Admirals Taylor and Robinson, and many others, what was happening at the time at the naval air station at Anacostia some miles distant. It was the first radio demonstration ever made, I believe, and quite an historical event to many of us."

(*Continued on page* 867.)

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Just as a good mirror can provide a truly realistic reproduction of your features so can good radio apparatus reproduce with fidelity the original studio performance. But it must be good radio apparatus, properly installed and properly maintained, and—of course, there must be a good loud speaker.

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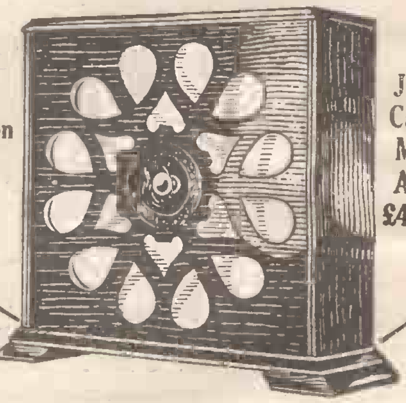

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Announcement of Graham Amplion Limited, 25, Savile Row, London, W.1.

ADDING THAT AMPLIFIER

An article of practical value to all set owners.

By A. JOHNSON RANDALL.

SOONER or later most listeners wish to add an amplifier to their existing set. In some cases they may desire to increase the range of their receivers in order to pick up Continental and other distant stations. If so, they need a stage of high frequency.

Now a high-frequency valve is not always easy to adopt. For instance, if the receiver already possesses a stage of high-frequency amplification it is highly probable that the addition of another high-frequency valve will cause uncontrollable oscillation unless the unit is very carefully designed. In view of this I never recommend a second high-frequency valve to be added to a receiver already containing a tuned high-frequency circuit. It is far too risky. The constructor who really considers that he needs two high-frequency valves should choose one of the tested designs which appear from time to time in the wireless journals, and follow the author's instructions to the letter. This is the only method of ensuring success.

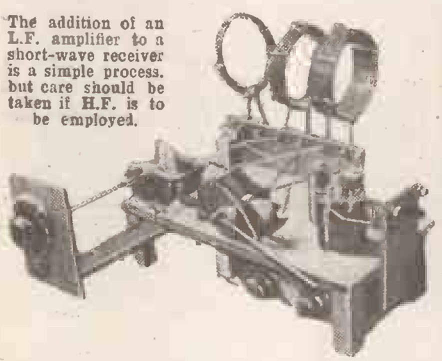
Adding an H.F. Unit.

In the case of a detector valve it is a somewhat simpler matter to add a high-frequency unit. The easy method is to use the existing aerial coil as a tuned grid winding and to employ what is known as a parallel feed scheme, neutralising the high-frequency valve with the aid of a split-secondary aerial circuit. Such a unit can be made very cheaply and is of great value in bringing in the distant stations. Signals which were practically inaudible can be brought in at good telephone strength.

A high-frequency stage, however, is not of a very great advantage in cases where loud-speaker volume is required from stations already obtainable at fair strength. If one wishes to work a loud speaker on local broadcasting the correct thing to do is to build a low-frequency amplifier.

A simple Reinartz detector will give really good telephone strength at distances up to 15 or 20 miles from a local main station. To magnify these signals to sufficient volume to work a loud speaker a two-valve low-frequency amplifier is necessary. The question is what type of amplifier is best from the point of view of maximum volume combined with good reproduction.

It is useless to magnify the signals if the results are not worth listening to. Two transformer stages will give enormous volume, but such an arrangement requires very skilled treatment if good reproduction is to be maintained. Moreover, only the most expensive transformers are suitable and care must be exercised both in arranging the lay-out and in the choice of a suitable *pair* of instruments. There is always a danger of the H.T. battery producing a coupling effect, and this in turn causes low-frequency oscillation and distortion. On the other hand, even the veriest novice can obtain good results from a stage of resistance coupling followed by a transformer. In addition, the combination is cheaper and will give quite good reproduction with a moderately priced transformer.



The addition of an L.F. amplifier to a short-wave receiver is a simple process, but care should be taken if H.F. is to be employed.

The overall amplification is not very far short of two transformer stages. With regard to values, much depends upon the loud speaker.

Suitable Values.

With the average horn type very good results are obtainable with a 200,000-ohm anode resistance, ·005 coupling condenser, and a 2-megohm leak. The transformer can have a ratio of 3 or 4–1.

For a cone-type instrument the coupling condenser could be ·01 mfd. and the transformer a 2·7 or 3–1 ratio.

For volume control a high-resistance potentiometer across the secondary of the transformer is a very convenient arrangement, and such potentiometers as the G.E.C., Igranic, Dubilier, Centralab, etc., are quite suitable.

Constructors often wish to add an extra low-frequency valve to reflex receivers already incorporating two stages, usually transformer coupled. The two-valve Hale is an example. This addition is not really advisable since there is every likelihood of low-frequency reaction troubles unless special precautions are taken. I would never recommend a third transformer, but with care it is possible to employ a choke or resistance-coupled stage. With every additional valve, however, it becomes vitally important to ensure that the rest of the set cannot introduce any unwanted effects capable of producing oscillation or distortion.

On the other hand, three resistance-coupled stages or two of resistance followed by a transformer are a workable combination, and their construction can be undertaken with every chance of success provided too high a magnification is not aimed at.

H.T. Connections.

For the ordinary listener a properly designed two-stage amplifier will give all the volume necessary and if greater strength is required then a high-frequency stage is desirable. This combination, namely, a high-frequency unit, detector with reaction, and a two-stage low-frequency amplifier will do practically everything that the average listener wants.

In adding an amplifier to an existing set it is unnecessary to employ two H.T. negative terminals. One battery will suffice and only one H.T.— lead is required. I mention this because some sets may have L.T. + joined to H.T.—, whereas in the unit L.T.— may be connected to H.T.—. Hence, joining the two H.T. negatives together would short-circuit the L.T. battery. One H.T. — connection will serve for both the set and amplifier because the L.T. terminals will be joined together and the H.T. circuit thus completed. This obviates the danger of damaging the L.T. battery, but I always prefer to remove any risk by joining negative to negative throughout, and I am of the opinion that the practice of connecting H.T.— to L.T.— will become standardised shortly.

For all round work, which includes a certain amount of distant reception, a two-stage amplifier will be found the most useful.

BROADCAST NOTES

FROM OUR BROADCASTING CORRESPONDENTS.

Festive Season Programmes—Mr. St. John Ervine's Play—"Rigoletto" Again—Provincial Features—"Christmas in Ulster"—Charity Ball at Newcastle—"The Magic Hour" at Liverpool—5 G B Morsels—In Scotland—Ghosts at Aberdeen—2 Z Y Helps Infirmary.

Festive Season Programmes.

THE special programmes arranged by Savoy Hill for the festive season extend from Sunday, December 18th, until the last day of 1927, and will be given from London, Daventry (5 X X), and the relay stations. Most of the items will, of course, emanate from the London Station, either as studio performances or as outside broadcasts, but others will be drawn from the various provincial stations, such as the play entitled "The Ship," and Verdi's opera "Rigoletto," for the performances of which the Manchester Station is responsible on Monday, December 19th, and Wednesday, December 21st, respectively.

Mr. St. John Ervine's Play.

It is now possible to give some further details of these transmissions and the artistes engaged for their presentation "The Ship" is a three-act piece by St. John Ervine, and falls, therefore, into the category of long plays, to which listeners in the North are particularly partial. It has already been given in the provinces, but this will be its "baptismal" broadcast from London.

Briefly the play deals with a conflict between an ambitious father and an easy-going son—quite a familiar plot, you will say—but treated here in an original and intensely dramatic manner. Miss Nancy Price, the well-known London actress, is to take a leading part, the other characters being portrayed by members of the Manchester Station Repertory Players.

"Rigoletto" Again.

"Rigoletto" undoubtedly ranks among the most popular operas that the B.B.C. broadcasts from time to time, and there is no necessity to extol its merits. Listeners will no doubt be interested to learn that the cast will include May Huxley, Gladys Palmer, Dennis Noble, Parry Jones, William Anderson, Reginald Whitehead, Norris Parker, Harold Marsden and Herbert Ruddock.

Provincial Features.

In addition to these special programmes, each B.B.C. station will give its own individual Yuletide programme, some of which are here described. Manchester has quite a number of seasonal transmissions, the first being on Tuesday, December 20th, when the Mid-day Society's Concert, consisting of Christmas Carols, will be sung by the Manchester Cathedral Choir. Christmas dance tunes and the old Yuletide game of charades figure in the programme on Thursday, December 22nd, while on Christmas Eve listeners will renew their acquaintance with "The Browns of Owdham" in a short play entitled, "Christmas Eve at Browns'."

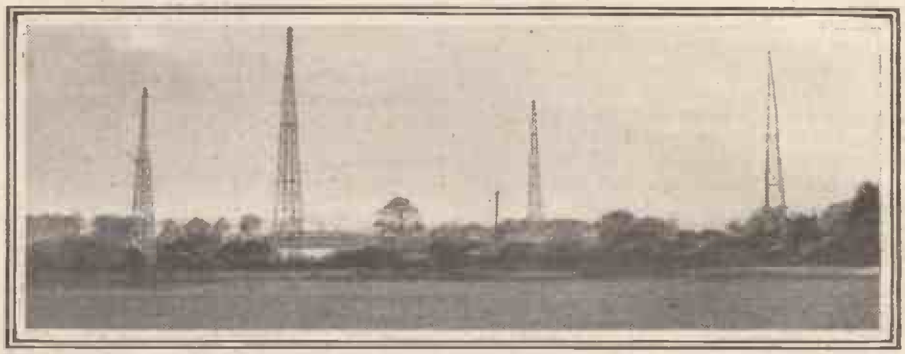
"Christmas in Ulster."

Belfast has a festive entertainment down for December 24th, under the somewhat comprehensive title of "Christmas in Ulster." All those who know of Mrs. Rooney and Mat Mulcaghey, the "Oul Besom Man from County Tyrone," will be listening.

It should be a jolly evening—these worthies and other items, such as, for instance, the traditional Ulster entertainment, "The Christmas Rhymers," collected and set down by H. Richard Hayward. This is really a dialogue which has never been in written form, but handed down by word of mouth from generation to generation. Others in the programme are W. R. Gordon, whose valuable work in collecting old Irish folk songs is well known; the Yuletide Singers, who are contributing carols and some rousing choruses; and the Station Orchestra.

Charity Ball at Newcastle.

From Newcastle comes the news of a Charity Ball, which is to take place at 9 p.m. on Friday, December 23rd, in the Grand Assembly Rooms, Barras Bridge. The event will, of course, be full of Christmas fun and merriment, though the entire proceeds will be handed over to the Lord Mayor's "Holiday Camp for Poor Children" Fund, with which the Newcastle Station has for a long time been identified. Music by Tilley's Dance Orchestra will be broadcast, and I am asked to say that inquiries for tickets should be made to the Station Director, B.B.C. Offices, Newcastle-on-Tyne



The Air Ministry's new D.F. station at Mitcham is almost complete. Above can be seen the arrangement of the four masts.

"The Magic Hour" at Liverpool.

Liverpool has two interesting Christmas features—carols by the choristers and organ solos relayed from St. Luke's Church, Bold Street, on December 22nd, and a Christmas Fantasy for children on Christmas Eve The fantasy, entitled "The Magic Hour," deals with the adventures of two children who visit a toy shop after dark.

5 G B Morsels.

It should be mentioned that the Christmas programmes from 5 G B, the Daventry Experimental Station, will provide distinct alternatives to those from London and those stations which take the London programmes. They include a carol concert lasting an hour by the Gloucester Cathedral choristers, relayed from the Chapter House, Gloucester Cathedral, on Wednesday, December 21st; a Pickwick party, taking the form of a Dickens' Dream Phantasy, in which some immortal characters come to life and attend a present-day party given by Pickwick, on Friday, December 23rd; a concert of Christmas music and carols on Saturday, December 24th, to be followed by "A Christmas Fantasy," by John Overton, with incidental music by the Birmingham Studio Orchestra; and a play, a symphony concert, variety and musical comedy programmes, with plenty of dance music on Monday and Tuesday, December 26th and 27th.

In Scotland.

Most of us who live south of the Tweed have always had the impression that Christmas in Scotland takes a very secondary place by comparison with the New Year. It would hardly be true, perhaps, to say that the B.B.C. is attempting in any way to introduce changes in the preferences of our Scottish friends, or that Scotsmen when they migrate South become so enthralled with the traditional spirit of an English Christmas that they are smitten (perhaps unconsciously) with some irresistible desire to implant among their compatriots these most laudable characteristics of the Sassenach. Whatever is the explanation, a glance at the Christmas programmes of the Scottish stations reveals very little, if any, difference from those of the English stations.

Ghosts at Aberdeen.

Aberdeen has gone so far as to put on a "Ghost Programme" on Thursday, December 22nd, quite a novel idea which does not seem to have been thought of by those at Savoy Hill. The most interesting item, to my mind, is a play entitled "Out of the Shadow," which promises to be a real hair-raiser. If you want a big thrill, and do not suffer from a weak heart, turn out the light when you listen to this programme.

2 Z Y Helps Infirmary.

A special service, relayed from the Manchester Royal Infirmary, will be broadcast at 7.45 p.m. Sunday evening, Dec. 18th., when the address will be given by the Rev. Benjamin Pollard, Rector of St. Chrysostum's, and chaplain to the Infirmary. Organ music by Mr. Edward Rorke will also be broadcast, both before and after the service, and this will be followed by a special Christmas appeal on behalf of the Institution by Mr. R. P. Goldschmidt, Chairman of the Infirmary.

SOME BROADCASTING LIMITATIONS

by De Groot

In an interview with "Ariel" De Groot, the well-known leader of the Piccadilly Hotel Orchestra, gives his views on radio.

DE GROOT, tall, silver-haired, debonnaire, is to-day, at forty-six years of age, an example of the triumph of genius and grit over disappointment, discouragement, and misfortune. De Groot at fourteen was what is now called a "boy-wonder"; so great was his promise that he was to have been sent to Berlin to study under Joachim—the greatest of all masters.

Just as his ambition and hopes were about to be realised, De Groot's father—himself a musician—had a serious accident and was crippled. The support of his family—mother, father, and younger brother—devolved upon this child; and for hours a day he played his violin in orchestras, cafés, cabarets, wheresoever he could. Imagine anything more soul deadening for this boy of inborn musical talent, whose hopes and aspirations some few months before had been so great, than the hour-long playing of that ear-jingling claptrap associated with the dance-hall and cabaret! He pulled through, and, what is more, salved his artistic soul.

During those years of struggle, De Groot, having realised his life's ambition had gone by the board, made up his mind to give the world the best of what they really wanted, with the best of what he could give. When he came to London he was little known, and when he joined the Piccadilly Hotel, some nineteen years ago, he went with the fixed determination of giving his public music of a quality and refinement never before heard outside a concert hall.

Unique Popularity.

The lighter operas of Verdi, Puccini, Mozart, and Bizet, the Lieder of Schumann and Schubert, the bergerettes of Reynaldo Hahn, the songs of Liza Lehmann, Landon Ronald, etc., were played to the public with a delicacy and perfection hitherto undreamed of; the large clientele of the Piccadilly Hotel became familiar with music they were rather apt to fight shy of; but when De Groot played a violin solo they realised they were listening to genius. They listened—and returned. Gradually he led them higher, to the music of Chopin and Strauss, Wagner, to the moderns, such as Rimsky-Korsakov, Stravinsky, and Dvorak, until to-day he has an unrivalled position in London.

His success, though not immediate, was immense, and to De Groot must be given the honour of raising the standard of music in the great London restaurants. All have copied him, many have tried to find his equal; none has succeeded.

De Groot has received many honours and distinctions—one of his most treasured, the personally expressed appreciation of his playing by their Majesties on a recent occasion; but above all he holds dear the numberless letters he received during the war from men and women of all classes and nationalities, thanking him for easing, if only for a few moments, the misery of their lives.

Omit Classical Selections.

De Groot was one of the first, with his orchestra, to broadcast for the British Broadcasting Corporation, and it is safe to say that that body has never employed an artiste, the popularity of whose concerts was so universal or general.

A recent portrait of De Groot, the popular violinist-conductor.

Unfortunately, some time ago, owing to a most regrettable misunderstanding, it became impossible to renew the contract between the B.B.C. and Mr. De Groot, with the result that many of his admirers have been denied the pleasure of hearing his playing. There is reason to believe, however, that the existing difficulties may be smoothed over, and that before long De Groot will be again a central attraction of the B.B.C. programmes. No one hopes this more than De Groot himself.

Under the circumstances it is hardly possible to expect him to criticise either the B.B.C. or their programmes, although the latter, in his opinion, are capable of improvement.

Of the general principles of broadcasting music, and its limitations, De Groot is intensely interested. In his mind he divides music into classical music, good music—and trash.

"Classical music," he said, "the compositions of the masters, such as Brahms, Bach, and Beethoven—to understand which needs a musical education in itself—should never, in my opinion, be broadcast.

"They must be played with a full orchestra—must be read not only through the medium of the music but also by the rendering of the conductor; just as one gains one's impression of a play not only through the spoken word but also through the actions of the player.

"The foundation and basis of all music and melody is the bass; without this, and with only treble and soprano, music is as strawberries without cream. The brass and tuba instruments so far have never been satisfactorily rendered in broadcasting. Whether it be the fault of the microphone or receiving set, it appears to be impossible to transmit a true rendering of the longer sound waves, truly proportioned to the shorter and more delicate waves of the reed and string instruments. Until this is achieved, classical music should not be attempted, as it disappoints the few who can truly understand, and gives no pleasure to the multitude.

Light Music Required.

"Good music, carefully selected, intermingled with chosen and artistically played dance music, is what the public wants.

"I found that my concerts were so popular because I chose with the utmost care only those pieces which, from twenty years' experience in London, have been always in demand.

"But the careful choosing of one's programme is not the only point in producing a successful concert. I have my platform placed at a suitable distance and height from the microphone; I arrange my orchestra so that the reed instruments—the flute, clarinet, and oboe, the most delicate in sound—are in front, the violins next, the 'cellos and piano behind.

"I rehearse the pieces for at least three hours, so that throughout my concert there is an evenness of tone and volume.

"This careful arrangement of one's orchestra and realisation of the present limitations of the broadcasting machine are essential, in my mind, to the presentation of what is always my ambition, and, I hope, my achievement—a truly artistic performance."

B.B.C. PERSONALITIES OF TO-DAY.

In which some well-known broadcasters are brought for once into the limelight.

By THE EDITOR.

THE rigid and appropriate application of anonymity gives the public hardly any opportunity of assessing or appreciating personalities within the B.B.C. It has been part of my business, however, to maintain close contact with all the heads of the various branches of the work of the B.B.C.

I propose now to give some account of the outstanding personalities concerned with the broadcast programmes, their administration, execution, and transmission. The one personality which, above all others, is indelibly stamped on the B.B.C. is that of Sir John Reith. He is rightly accepted as one of the greatest administrators of the age.

Controller of the B.B.C.

There are probably not more than five or six other men in Europe with anything approaching his genius for organisation, and his dynamic energy. Its pre-eminence as an organisation, its high moral tone, its ethical and educational outlook, and its dignity—these and kindred virtues of the B.B.C. may be put solely to the account of Sir John Reith.

Whilst still in the Navy, Admiral Carpendale (now controller of the B.B.C.) had a world-wide reputation as a disciplinarian of uncanny efficiency. He has carried forward his tradition at the B.B.C. The staff is handled in the best naval manner, not unmixed with kindness. Off duty, Admiral Carpendale resumes his normal juvenility; he is then the brightest and cheeriest of companions.

It speaks well for the adaptability of the B.B.C. controller that, although up to two years ago he had had little or no contact with diplomacy or international affairs, he is now the head of the Union Internationale de Radiophonie. In this capacity he travels a great deal on the Continent, and is warmly welcomed as a splendid specimen of the Englishmen of his class and tradition. The fine flavour of the sea is always present with the gallant admiral.

Captain Eckersley, one of the few old-timers still on deck, is perhaps the best-known personality in the B.B.C. He has made a religion of broadcasting. With him it is very nearly the be-all and end-all of his existence. Such devotion has brought him more responsibility and anxiety than material reward. He is much more than Chief Engineer; he is a master of the microphone manner, and is a considerable success as a programme builder.

Behind the Scenes.

Captain Eckersley belongs to that rare and fortunate group who, although occupying high position, have sufficient reserve of self-confidence, personality, and natural dignity to make it possible for them to conduct their work in the manner of friendly intimacy with all subordinates. The devotion of the four hundred engineers of the B.B.C. to their chief is tremendous, yet there is no artificial atmosphere of respect. Captain Eckersley, with Admiral Carpendale, has done a lot on the international side. In addition, Captain Eckersley is a journalist of capacity and reputation.

A man few listeners know anything about is Major Gladstone Murray. Before the war he was a Rhodes Scholar at Oxford, but after a distinguished career in the Army he is now installed at Savoy Hill in the capacity of Director of Publicity, propaganda, spell binder, and general diplomatist for the B.B.C.

He has been described as "the brilliant mystery merchant," and certainly, in Major Murray, the B.B.C. have a man with not only a Class A brain, but a mind as subtle as—well, never mind who's! An unassuming, quiet, softly spoken man, Major Murray might be imagined in the rôle of "Mr. X." of the Secret Service and Intelligence Bureau in one of Mr. Oppenheim's stories. The only drawback to that bit of imagination is that he is too intelligent for a fiction rôle.

There must be something in the theory of eminent qualities running in families. Only perhaps they take longer to come out in some cases than they do in others. Thus we get Mr. R. H. Eckersley as much a genius in his own line as is his brother, the Chief Engineer, or his other brother, the renowned research scientist. "Roger," as he is affectionately known by his chief and by his subordinates alike, has included the Foreign Office and poultry farming in his varied career. Roger's special function in life at present is to spread oil on troubled waters. He is the guide, philosopher, and friend to Savoy Hill. Turbulent spirits, distraught artistes, embittered composers, thwarted conductors, and over-worked officials restore their shattered mind in the pervading peace of the sanctum of the Head of Programmes.

Then there is Mr. Thomas Lochhead, Chief Accountant of the B.B.C.

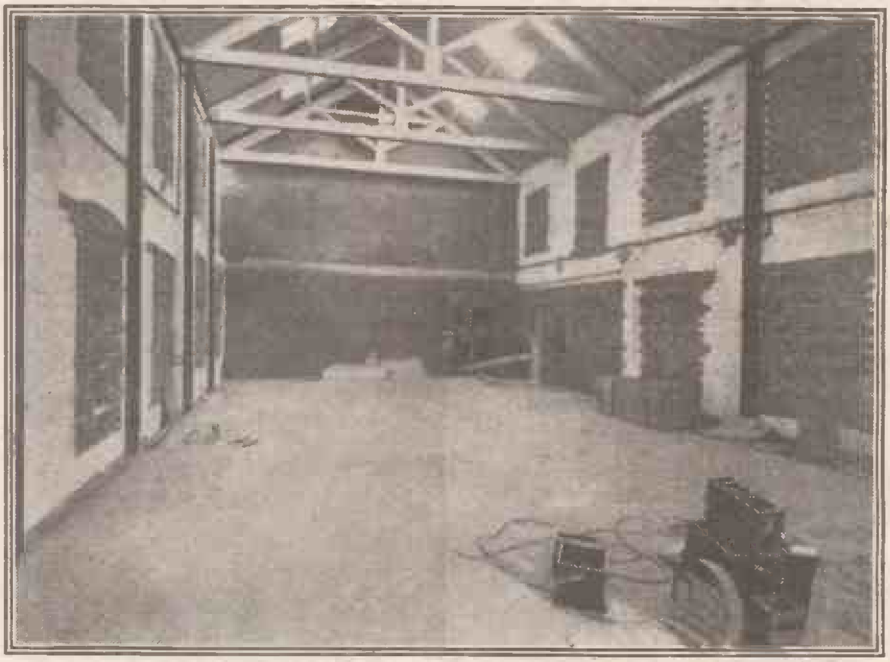
Provincial Personalities.

It is perhaps fitting that Mr. Lochhead hails from the other side of the Tweed. Anyway, the B.B.C. auditors, who are the only people qualified to judge, have declared repeatedly that Mr. Lochhead is nothing short of a financial genius, and that he handles the gigantic accounts of the B.B.C. with scarcely any staff at all. But Mr. Lochhead's interests in life are not bounded at one end by the multiplication table and at the other by the rate of exchange.

It is common knowledge among book-lovers that Mr. Lochhead is a dangerous opponent at all the more exclusive sales of treasured volumes and limited editions.

Of picturesque personalities outside London, Mr. Neil Maclean, Station Director at Aberdeen, is easily first. Mr. Maclean wears the kilt from day to day. He is Celtic in outlook, in personality, in accent, and in ambition. Throughout the Highlands, to the remotest of the Western Isles, Neil Maclean as a Gaelic singer is a household tradition

Down in Cardiff is Mr. E. R. Appleton. Perhaps it is by way of contrast, or maybe I am wrong, when I suggest that there is no smoke or rain or drabness at Cardiff. But anyway, whether by contrast or to be in tune with existing conditions, Mr. Appleton has created a host of Sunbeams and Moonbeams, and organisations of Sunbeams and Moonbeams, in the vast area from the mining villages of the Rhondda to the western terminus of the Cornish Riviera Express.



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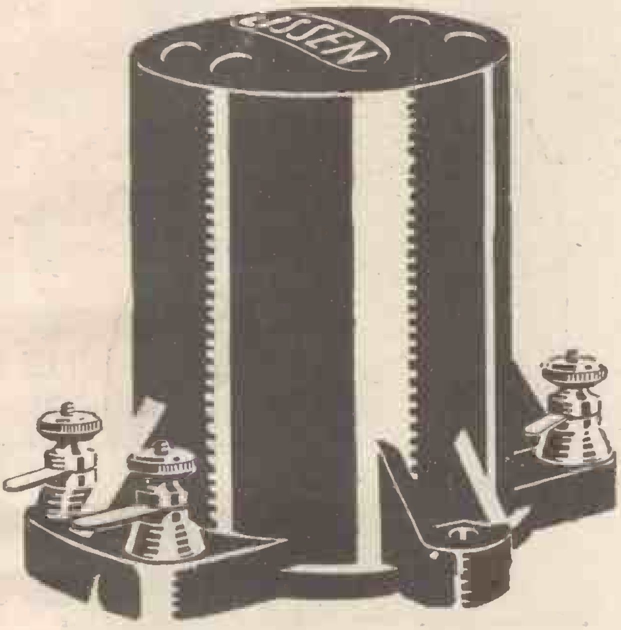

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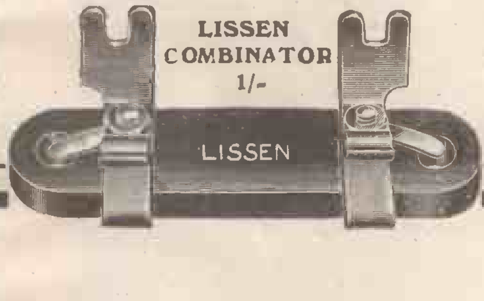

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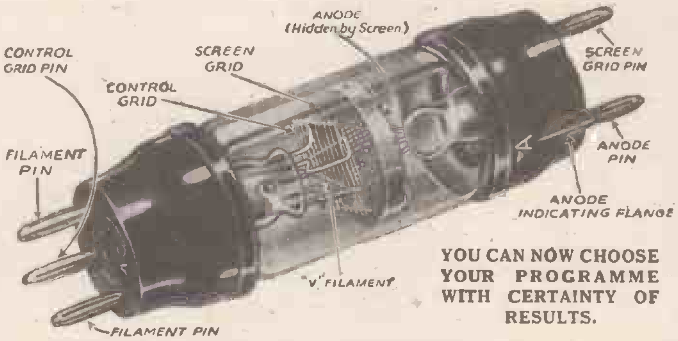

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MAKESHIFT NEUTRODYNE CONDENSERS.

You can damage your batteries or even burn out your valves if you do not take precautions when using improvised or "shaky" components in your set.

By **O. J. RANKIN.**

THE small balancing or neutrodyne condenser is such a simple device that many constructors regard the commercial product as an extravagance which can be easily avoided by making up a substitute from any odd parts and materials that happen to be lying about.

Generally, this is a great mistake, for in radio it is often the small and insignificant components which call for the greatest care in design and construction. One is sometimes bored to distraction over the old cry about using only the best quality components, but in the long run it is often realised that it is better to be bored than sorry.

Note This Possibility.

The novice who constructs and uses a makeshift neutralising condenser is "playing with fire," and before fitting the device to his receiver he will do well to consider the fact that the very best "neut" on the market—something which can always be relied upon—costs but a few shillings, and that valves are still expensive items to replace, in spite of the recent price reductions.

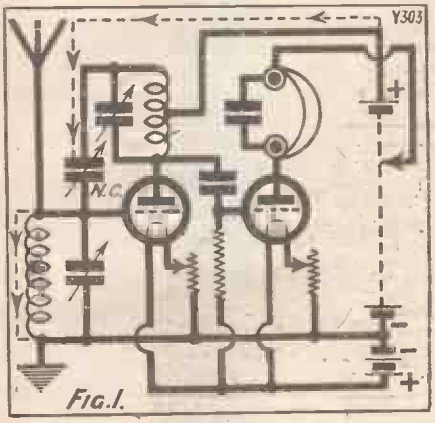


FIG. 1.

But let us see what atrocities may be perpetrated by using a faulty "neut." The accompanying diagrams duplicate a simple two-valve circuit employing a neutrodyned stage of high-frequency amplification, followed by detector, and the small neutralising condenser (N.C.) is connected as usual, between the grid of the high-frequency valve and one end of the centre-tapped tuned-anode coil, i.e. between the grid and plate of the high-frequency valve, via the coil.

Now, one of the greatest faults in a badly made N.C. is lack of rigidity, and this invariably means that sooner or later the two plates will touch, or otherwise short circuit. If such a thing happens, then, as the student said when unravelling the problem of what happens when an irresistible force meets an irresistible object, "something's got to go." Just what "goes" will depend upon the method of connecting the H.T. negative. If this is joined to L.T. negative, as shown in Fig. 1, then the result is that the whole of the H.T. battery is ruined by a short circuit.

Imagine the moving plate of the N.C. to be touching the fixed plate. Trace the dotted line from the H.T. positive, and you will see that it passes first through the top half of the anode coil, across the defective N.C., through the aerial tuning coil (which, being of 35 or 50 turns for the usual broadcasting wave-lengths offers very little resistance), and straight along the L.T. negative lead to the H.T. negative, thus short circuiting the H.T. battery.

This, of course, is a serious matter, yet it fades into insignificance when compared with what might happen when the H.T. negative is connected to the L.T. positive, as in Fig. 2. In a single word the result will now be "Phut"—which is a more or less scientific description of a bright blue flash indicating the burning out of all valves in circuit.

May Burn Out Valves.

In Fig. 2 I have endeavoured to show exactly how this happens, and by following the dotted lines as in the previous example (from H.T. positive to the short-circuited N.C.) it will be observed that we get as far as the L.T. negative lead, via the A.T.I., as before, and then, not being able to run direct to the H.T. negative, part of the H.T. current passes through the valve filaments, and so "home," the filament resistances being totally incapable of dropping the high voltage. But the matter does not end here. The remainder of the H.T. current, seeking another path of destruction, runs through the L.T. battery to H.T. negative ("home") and thus both batteries are damaged.

Such risks cannot be ignored. The best policy is, of course, to use a condenser of reputed make and leave nothing to chance; but if any amateur is at present in possession of a doubtful component I would strongly recommend the simple method outlined in Fig. 3, where a small fixed condenser X, having a capacity of about ·001 mfd., is inserted between the N.C. and the coil in order to block the H.T. current in the event of an accident. This is a safeguard which is found in almost every neutrodyne circuit used in France, and in cases where the proper component is not available it is certainly a necessity, too often ignored.

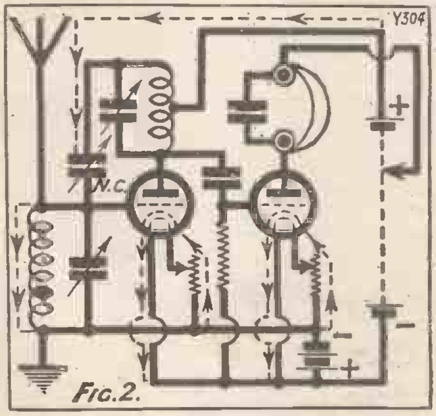


FIG. 2.

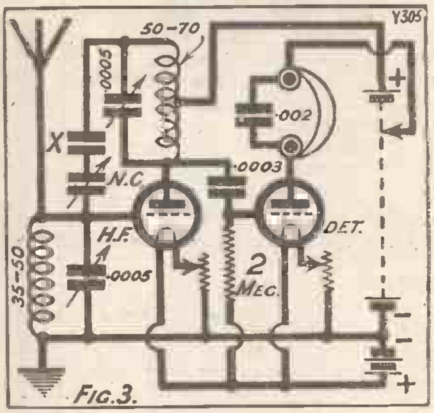


FIG. 3.

RADIO REMINDERS.

A constant humming noise is generally due to the fact that either the aerial lead, the earth lead, or the set itself is too close to the electric-light mains. (Remember that these are sometimes concealed in the wall.)

* * *

The capacity of the average 100 ft. (or thereabouts) amateur aerial is in the neighbourhood of ·0002 or ·0003 mfd.

* * *

Where trams or other electrical machinery produce interference with reception it is often found that a counterpoise earth will give better results than a direct connection to a buried plate.

* * *

The proper way to disconnect battery leads is at the *battery* end, not at the set end? If the wires are left on the battery and unfastened at the other end, there is a great danger of shorting the battery.

* * *

If an L.T. battery is allowed to stand in a discharged condition for very long it will be seriously attacked by sulphate, and may be injured rather badly.

* * *

It does not matter in the least if the accumulator has been accidentally connected the wrong way round—i.e. its negative to L.T. plus on the set and its positive to L.T. negative. Very often, as a matter of fact, this improves reception.

* * *

An ordinary flash-lamp bulb connected in the H.T. negative lead makes a very good fuse, and may save your valves.

* * *

If sulphuric acid from an accumulator is spilt upon a floor or a carpet it will rapidly "eat it away" unless the sulphuric acid is neutralised? This can be done by ordinary washing soda, bicarbonate of soda, or ammonia, if applied freely and at the fullest possible strength.

A CHEAP EARTHING SWITCH

AN efficient and cheap earthing switch and safety gap combined can be constructed from the contents of the average listener's "junk box."

The parts required are as follows:

1 Ebonite panel, 2½ in. × 2 in.
1 Ebonite strip, 2 in. × ½ in.
4 Valve sockets (flush-mounting type).
4 Valve pins.
2 Soldering tags.
1 2 in. length of ½ in. × ¼ in. brass.
1 2 in. length of ½ in. × 1/16 in. brass.
Panel transfers.
2 Wood screws.

First, square up the ebonite panel and slightly bevel the front edges.

Turn the panel face downwards and score a line at dead centre, i.e. 1¼ in. from the top and bottom. At a ¼ in. from each end of this line drill a 3/16 in. or ¼ in. hole, according to the size of the wood screws. Countersink these holes from front of panel until the screws fit snugly.

Constructional Details.

Next score a line ½ in. from the top, and another ½ in. from the bottom of the panel. On each of these lines drill two holes ⅜ in. from the sides, and sufficiently large to take the sockets chosen. Fig. 1.

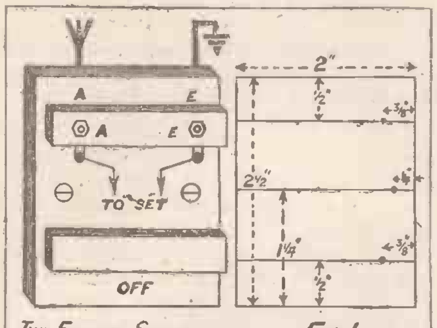
Now take the 1/16 in. brass strip and drill a hole ⅜ in. from each end (these holes being the same size as those provided for the sockets).

On either side of one of these holes, drill a further hole, and merge all into one oval slit by means of a small file. Fig. 2.

Next cut this strip into two pieces and, with a fine file, serrate the newly formed edges. Fig. 2. This will be found easy if both parts are clamped in a vice and filed together.

The panel can now be assembled. First apply the transfers as shown, then insert the sockets in position.

The sockets marked A and E should each be fitted with one of the prepared brass strips, to form the spark gap. (This can be arranged either in front or behind the panel, but is neater in the latter position.)



THE FINISHED SWITCH. FIG. 1.

By means of the oval slit the gap can be adjusted until the serrations are almost, but not quite, touching.

The strip of ebonite is now drilled ⅜ in. from each end, and the valve pins, each carrying a soldering tag, are fixed. Fig. 3. This strip is labelled A and E, and is provided with two wires to the aerial and earth terminals of set.

The ½ in. brass strip is now prepared in a similar manner, except that no wires are fitted. Now solder aerial and earth to their respective sockets and screw the switch to the wall.

By using distance-pieces of ebonite tube or wood the sockets can be kept clear of the wall. Fig. 4.

The Device in Use.

To operate, the ebonite strip is plugged into the switch, so that A joins A, and E joins E. This can be left undisturbed during the whole time that the set is in use.

When switching off, the brass strip, which has meanwhile been safely housed in the "off" sockets, can replace the ebonite strip and will completely isolate the set.

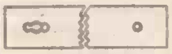


FIG. 2.

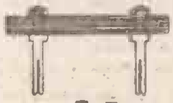


FIG. 3.

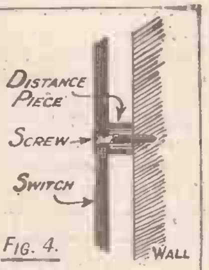


FIG. 4.

2757

Although there is a general belief that such a switch is useful only in the summer months, when lightning and thunderstorms are prevalent, it should not be forgotten that rain, snow, and sleet, are all liable to convey static electrical charges to the aerial. If no switch of the kind described above is provided, and if the set is fitted with a series aerial condenser, it is possible to receive an unpleasant shock when touching the aerial wire or terminal. This can be completely obviated by the use of this little switch, easily constructed from spare components or parts, as described above.

DO YOU KNOW THAT—

When a set which has hitherto been well-behaved starts to howl and distort, the most likely cause of the trouble is the H.T battery running down.

* * *

It is generally the almost too-obvious troubles—such as the use of a piece of broken flex, or a valve which is making faulty contact with its valve holder—that get overlooked longest.

* * *

Every time a pair of telephones is dropped from the table on to the floor the magnetism is weakened, and the life of the telephones made shorter.

* * *

A good rough-and-ready test for oscillation in a receiver is to wet the finger and touch the aerial terminal with it? If a loud "click" is heard every time the finger goes on *and off* the aerial terminal you can be pretty sure that the set is oscillating.

FILLING "WAVY" EBONITE PANELS.

MANY, no doubt, are in the habit of filling drillings in old panels with cobbler's wax, "glitterwax," or other appropriate substances, but those who have wavy finish panels to rejuvenate probably do not like tackling the job. It is quite simple, however. Just fill up the hole in the usual way with some black substance which sets hard, and then take an extremely fine needle scriber, and scratch the filling to a similar pattern. Most wavy finish panels have a machine-made repeat pattern, and if the lines of a small section are studied, it will be found to be quite easy to make a duplicate figuring. A magnifying glass will prove useful to those who wish to execute such work with real skill and care.

EASILY-MADE CHOKE FORMERS.

EBONITE is, of course, the best material for constructing the former to carry the winding of an L.F. choke, but if you like making your own apparatus and are not fortunate enough to possess a lathe, you will find it hard to make a satisfactory one-piece ebonite bobbin. The black adhesive tape which is sold for insulation purposes can be built up into excellent formers in the way shown in the sketch.

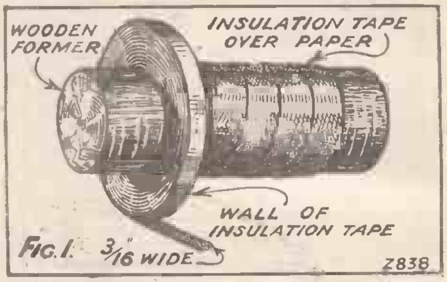
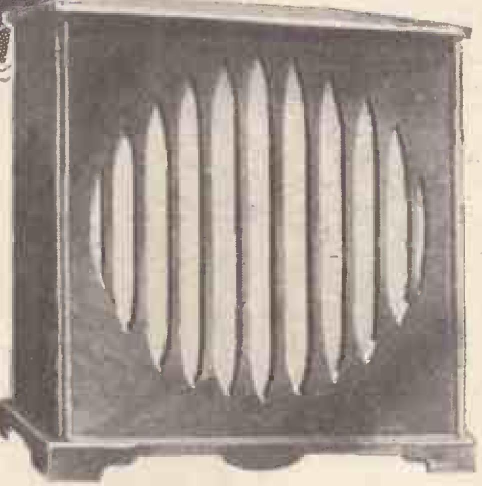


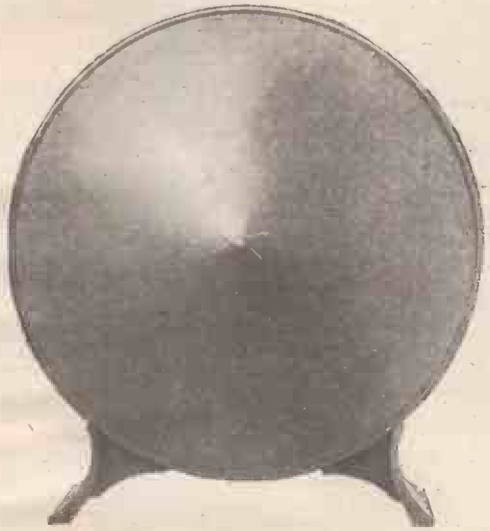
FIG. 1.

Determine first the dimensions of the iron core, and then make an equivalent wooden former. Round this wrap a piece of cartridge paper of the correct length for the former, sticking its overlapping edges together, but being careful that the paper does not adhere to the wood. Over the paper wind a strip of the insulation tape. Now unwind a long strip of the tape from the roll and tear from it a strip about 3/16 in. wide. Wind this round one end of the former, building up a narrow wall of tape. Keep the wall upright, squeezing it firm with your fingers, warming the tape if it does not stick properly. Build up a wall of tape at each end of the former high enough to retain the coil winding.

Formers made in this way will be found to be surprisingly strong. The wire is wound on with the wooden former still in position, the ends of the wire being pushed through the walls with the help of a needle. The winding is then taped over, the bobbin is slipped off the wooden former, and the iron core is put in.

SIX-SIXTY's Stupendous Achievement in Evolving the PERFECT CONE SPEAKER





And it really is stupendous! Never in the history of Radio has such a wonderful success been attained. Six-Sixty experts have achieved the almost impossible in the design of the New Six-Sixty Speakers. They have combined the clear cut notes of the Horn Speaker with the mellow beauty of the Cone. Until now, this has been reckoned an utter impossibility. Hearing is Believing. Go to-day to your dealer and ask him to demonstrate the New Six-Sixty Speakers. You will be amazed! You will hear what you have never heard before — Crystal clear reproduction which is absolutely natural and true to life. Every high and low note of the orchestra is reproduced with an unequalled clarity. Nobody has ever heard anything like it.

SIX-SIXTY SPEAKERS WILL, LIKE THE FAMOUS SIX SIXTY VALVES, BE THE MEANS OF ATTRACTING THOUSANDS TO RADIO.

PRICES: PEDESTAL TYPE £2 : 5 : 0
CABINET TYPE £4 : 4 : 0

The Six-Sixty Speakers will be gladly demonstrated at any of the 170 depots of Messrs. Currys, the Cycle People.

In any case of difficulty write direct to us, enclosing your dealer's name and address.

SIX-SIXTY SUPREME CONE SPEAKERS

The Electron Co., Ltd., 122-124, Charing Cross Road, London, W.C.2. Tel. Regent 4366.

CORRESPONDENCE.

THE "SYDNEY" TWO

"ADVICE FROM AMERICA"— THE "NOVEL" ONE.

Letters from readers discussing interesting and topical wireless events, or recording unusual experiences, are always welcomed; but it must be clearly understood that the publication of such does in no way indicate that we associate ourselves with the views expressed by our correspondents, and we cannot accept any responsibility for information given.—EDITOR.

THE "SYDNEY" TWO.

The Editor, POPULAR WIRELESS.

Dear Sirs,—I built up your "Sydney" Two on Saturday and within an hour I logged 2 X A D transmitting a New York and W G Y programme.

I heard every word of Miss Ruth Elder's homecoming speech. On Sunday I had many English and foreign amateurs,

The only difficulty I had was with the reaction. I remedied this by adding more turns, maybe about 4, making 11 in all the reaction coil.

I am only waiting for a suitable night, or day, to attempt to receive 2 F C.

Thanking the "P.W." Staff for such a good set,

I am yours,

G. S.

Smethwick.

The Editor, POPULAR WIRELESS.

Dear Sir,—Having made up the "Sydney" Two wireless set from instructions in "P.W.," I should like to state that I received 3 L O Melbourne direct on Sunday 19th. This station was testing on 36 metres and strength was about R4 during the whole programme. I first picked up the station at 6.45 p.m. 7 o'clock time signal. Then followed a programme of gramophone records, including songs by Albert-O-Jay, tenor, news reports, and readings from "The Morning Argus." The station closed down at 8.25, with the announcement that these tests were to be continued every Sunday at 18.30 G.M.T. until further notice. I can also receive K D K A. and W Y G any night at excellent strength. Thanking you for such a splendid set, with every success to "P.W."

Yours faithfully,

A. B.

Broadstairs, Kent.

"ADVICE FROM AMERICA."

The Editor, POPULAR WIRELESS.

Dear Sir,—Undoubtedly your article entitled "Advice From America" will by this time have been read and discussed by all keen British Radio Amateurs.

All agree, I think, that British amateurs feel keenly their forlorn position as they grope their way towards a discovery of their true status, but, even down to the youngest among us, all must resent this superior attitude which our American cousins endeavour to hold over us.

Since the war there seems to have swept over this country an idea that, in all our actions and interests, work or play, arts and science, we must compare our standards of attainment with those achieved across the water. Politics, education, sport in all its branches, motoring and radio are all examples in which America has recently "shown us how things ought to be done." I am afraid the British amateur is a lumbering fellow, scarcely having the courage to support his own convictions at times, but nevertheless, he "gets there" in that unassuming manner which is typical of the Briton. We make no pretence to "superior knowledge" in-so-far as radio is concerned; nor do we desire to compete in the international race for the Radio Laurel Wreath.

It is extremely difficult to teach the American Radio amateur (I disdain the Americanisms "fan" and "ham") anything about Radio and we are sorry to read of the opinion which he holds of us, but probably time will reveal to him that British amateurs have "got on to themselves" and been there a long time!

To touch once more upon the question of the status of the British Radio amateur, there seems to be but one possible means of achieving recognition in the eyes of our government. It cannot be expected that a government will recognise any one of a number of societies devoted to a common cause. Amalgamation, may I suggest, is the surest method of enabling the British amateur to remain unto himself and lead the way in amateur Radio.

I am, yours faithfully,

A. W. B.

Skelmanthorpe.

THE R.S.G.B. AND Q.S.T.

The Editor, POPULAR WIRELESS.

Dear Sir,—I feel that I should like to say a few words concerning your article in a recent issue of "P.W.," in which you mention extracts from the editorial of Q.S.T. for December, dealing with amateurs in U.S.A. and Great Britain. Being a regular reader of Q.S.T I have been following amateur radio in U.S.A., and comparing the situations "over there" with conditions here.

I must certainly say that we are a long way behind here in amateur radio matters. The A.R.R.L. is undoubtedly the most "go-ahead" body existing for amateurs at the present time. Our R.S.G.B. is very much appreciated, of course but they do not assist the amateur in problems which deal with the subject of separate wave-lengths for amateurs. The A.R.R.L. is seeing to it that the exclusive wave bands at present in force for amateurs in U.S.A. are to be kept for such if possible.

What is the R.S.G.B. doing in this matter for amateurs in this country? The A.R.R.L. also does all in its power to bring the different branches working in its name together at annual, and even more frequent events, to enable secretaries and members to discuss problems which occur in their own particular sections.

In closing, I would say that I fully agree with all your remarks in your article.

I am, of course, open to criticism, and will welcome other letters on this subject.

I am, sir,

Yours faithfully,

Farnham, Surrey. J. N. R.

THE "INEXPENSIVE" ONE-VALVER.

The Editor, POPULAR WIRELESS.

Dear Sir,—I have pleasure in writing to tell you of the results obtained from an "Inexpensive" One-Valver.

I have received over ten stations, including Dublin, Langenberg, Stuttgart and Radio-Paris. The last three can be obtained at any time.

I have tried many valve circuits, including one with H.F. amplification, but your set beats the lot.

Yours faithfully,

Manchester. W. E. N.

SHORT-WAVE RECEPTION.

The Editor, POPULAR WIRELESS.

Dear Sir,—Re G. M. O.'s letter in the November 19th issue of POPULAR WIRELESS. It may interest you to know, I have been receiving on short waves for the last two years, using a broadcast receiver (1-v-2 tuned anode, reaction on anode coil) ("Four-valve Family receiver"). I can get down to 14 metres, using home-made coils. Using an indoor aerial and counterpoise, telephony has been heard from 2 X A D, 2 X A F, 2 X G, K D K A, 2 M E, P C J J, C F, A N H, also from two Australian amateurs, 7 C W and 6 A G. On Morse, I have heard amateurs from E A, E B, E C, E D, E E, E F, E G, E I, E J, E K, E L, E M, E N, E O, E P, E S, E T, E U, A F, A I, A M, N C, N E, N J, N P, N R, N U, S A, S B, S C, S U, F C, F M, F O, F Q, O A and O Z.

The anode coil and aerial coil are both tuned by ·0005 variable condensers. Best of luck to "P.W."

Yours faithfully,

T. H. S., JUNR.

A.R.R.L., T. and R., R.S.G.B.

P.S.—I do not use the high-frequency valve on the short waves, as I get just as loud signals with the valve turned out.

Middlesex.

DID YOU KNOW THAT . . . .

ONE of the commonest causes of poor reception in a crystal set is a dirty contact at the lead-in, or at the earthing switch.

* * *

When working on the short waves the aerial coil should be coupled *loosely* or the set will refuse to oscillate.

* * *

A hydrometer will enable you to test an accumulator quite as well as, if not better than, a voltmeter.

* * *

When a set with Reinartz reaction persists in oscillating fiercely at a certain reading of the dial, the trouble is often due to a high-frequency choke with an insufficient number of turns.

* * *

It is not safe for an unskilled person to interfere with the electric-light wiring in the house.

A GRID BIAS NOTE.

The Editor, POPULAR WIRELESS.

Dear Sir,—In usual practice the detector grid leak is taken to the positive side of the L.T. battery. I have found that an improvement in volume and tone can be obtained by connecting the negative side of the L.T. battery to the negative end of a grid-bias battery, the positive end of which is then connected to the lower end of the detector grid leak. By this means the positive bias on the detector grid can be varied—i.e. reduced to 1½ volts or increased at will. It will be found that reduced potential has quite a wonderful effect, especially in cases where old valves are being used. By this method I have improved a number of sets in this neighbourhood past all recognition, both as regards volume and purity of tone.

An additional grid-bias battery is not really needed. If the lead from the L.T. negative be taken to the centre of the L.F. grid-bias battery, the lead to the detector grid can be taken from the positive side of this centre tap and the lead to the L.F. grid from the negative side.

Where a combined H.T. and grid-bias battery is in use, it is essential that the negative ends of the L.T. and H.T. batteries be connected, and not the L.T. positive to H.T. negative as is the case in many sets. Where the L.T. positive and H.T. negative connection exists, it must be altered, otherwise a step-up in potential on the detector grid would result.

Yours faithfully,

R. D. G. MUSSETT.

Sanderstead.

EMPIRE BROADCASTING.

The Editor, POPULAR WIRELESS.

Dear Sir,—With reference to your article on "Empire Broadcasting" in "P.W." of August 27th, I have to advise that were it not for broadcasting on the short waves we would be in a sorry plight, as far as radio reception is concerned in this part of the world.

Reception other than short waves is only possible here, and then not consistent, during November, December, and January. Short-wave reception is consistent throughout the year. It is impossible to hear from your side except on short waves even during the cooler months.

The test from 5 S W, Chelmsford, on 24 metres last week-end was received by me with loud-speaker strength. Quality excellent and fading practically nil. This B.B.C. station should come in well, seeing that I received 2 N M, Mr. Marcuse's experimental short-wave station regularly, and that this gentleman was using 2 kw. of power, whereas the B.B.C. is supposed to be using 30 kw.

I take this opportunity of offering my congratulations to the B.B.C. and also to Mr. Gerald Marcuse, who, in my opinion, successfully proved that the transmission of programmes over long distances on short waves is possible.

Trinidad is an island situated on the north-east coast of South America, where tropical static is to be encountered the year round on the longer waves.

By the use of short waves this static is reduced to practically nil.

Yours faithfully,

A. R. MCLEAN.

Pointe-a-Pierre,
Trinidad, B.W.I.

THE "NOVEL" ONE.

The Editor, POPULAR WIRELESS.

Dear Sir,—May I congratulate Mr. C. T. Perrin on his excellent circuit, the "Novel" One, which you published in a recent issue.

I have hooked up this set and, with one stage of note magnification, results are all that can be desired. Using a 75-turn coil (Edison Bell) the following stations "came in" at good 'phone strength Daventry (5 G B), Berlin, Toulouse, Hamburg, Manchester, Frankfurt, Stuttgart, Madrid, London, Leipzig, Dublin, Stoke and one or two unidentified. All these on my indoor aerial, consisting of 100 ft. "Electron" and 30 ft. No. 20 D.C.C.

Should it be of interest to your readers, I may say that a power valve is most suitable and the grid-leak value 3 megohms. H.T. — 60 volts detector, and 100 volts L.F. Rheostat adjustment is somewhat critical, otherwise tuning is exceedingly simple.

At any rate this circuit is the finest I have yet experimented with and is well worth trying out.

Wishing your paper every success, and thanking you for its many useful hints, etc. I remain,

Yours very truly,

J. H. H.

Burton-on-Trent.

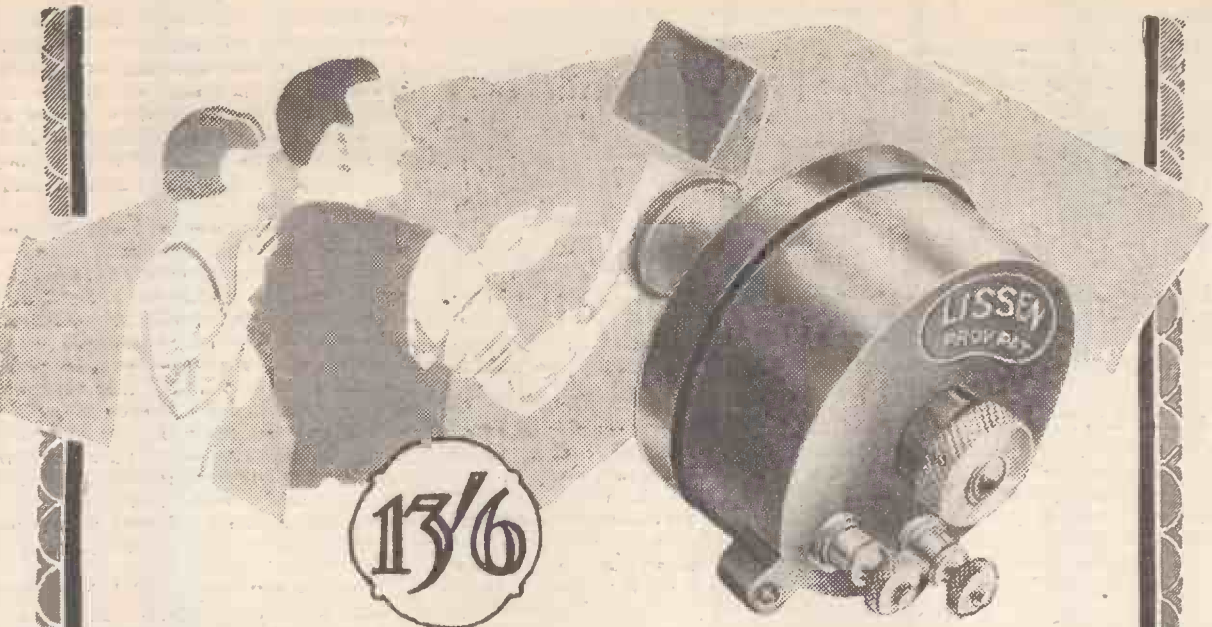
The Editor, POPULAR WIRELESS.

Dear Sir,—While looking through the letters I came across a letter by C. T. Perrin, and the "Novel" One. I have had a set built with the circuit for the last three years, and can trace it back as far as 1920. The circuit is a form of Colpitts oscillator, as for DX. it is A1. I have had all the B.B.C. stations except Manchester and a good dozen foreign stations, and I never use more than 24 H.T. I am an old reader of "P.W." and wish it every success.

Yours truly,

S. HALL.

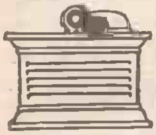
Blaydon.



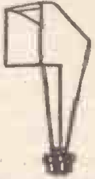
Now no home need lack a Loud Speaker

The introduction of the LISSENOLA at the amazingly low price of 13/6 created an unparalleled stir. Unbiased critics seated behind a screen and asked to distinguish between a thirteen-and-sixpenny LISSENOLA and other loud speakers selling at several pounds have been completely at a loss.

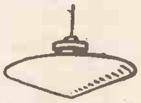
Make the test for yourself: go to your nearest dealer and ask him to put on the best loud speaker in his stock. Then use the same horn on the Lissenola, and see if you can notice any difference.



The "Lissenola" instantly converts any gramophone into a loud speaker.



Full directions for making this horn are given with every "Lissenola."

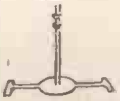


Another way of utilising the cone diaphragm method of construction.

THE LISSENOLA is sold exactly as illustrated above, and with every instrument are simple directions and full-size exact patterns which show you clearly how for a few pence to make a horn of proved efficiency to attach to it. Or if you possess a gramophone or any loud-speaker horn—or any horn or trumpet—that will serve admirably.

GET A LISSENOLA for *your* home — and build yourself a loud-speaker fully equal in performance to the finest that money can buy. You can cover the horn with fancy paper, or wallpaper, and paint it to resemble a factory article. Also by using the Lissen Reed (sold separately for 1/-) the Lissenola will carry a cone, or any other diaphragm working on the reed principle.

A cone Diaphragm loud speaker can easily be constructed. The illustration shows one method of mounting.



The "Lissen" Reed Attachment (pat. pending) for use with cone diaphragm loud speaker. Price 1/-

Your dealer will gladly demonstrate and supply—or send postal order direct

BUY THE LISSENOLA

and build your own loud speaker

LISSEN LTD. (Managing Director: T. N. COLE), Lissenium Works,
8-16, Friars Lane, Richmond, Surrey.
'Phone: RICHMOND 2285 (4 lines). 'Grams: "Lissenium, Phone, London."

Apparatus Tested

Traders and manufacturers are invited to submit wireless sets and components to the "P.W." Technical Department for test. All tests are carried out with strict impartiality in the "P.W." test-room, under the supervision of the Technical Editor, and the general reader is asked to note that this weekly article is also intended to provide a reliable and unbiased guide as to what to buy and what to avoid.—EDITOR.

L.S.A. DRY BATTERIES.

THERE recently arrived in our office some dry batteries made by the original manufacturers of Leclanché cells. They were sent by Messrs. Thomson & Company, Old Swan Lane, London, E.C.4, who have been appointed sole British agents for them in this country. The batteries are made in Switzerland and are distinctive for their bright red and black coverings.

The 60-volt H.T. battery which retails at 8s. 6d. embodies novel features. On the top are a series of pairs of small white labels, one of each pair bearing an H.T. voltage indication. The other disc of each pair consists of thin paper and can be broken to reveal the socket. Thus it acts both as a seal and as a protection against dust should the particular socket not be required for use.

Another commendable point is that the battery is tapped at every 1½-volts up to 9 volts. It is compact and well assembled and the tests we have been able to give it would appear to indicate that it should possess a good average working life. The small 4½-volt batteries, which are to be retailed at 10s. 6d. per dozen, also incorporate a novel feature. Instead of two sockets, each possesses one socket and one small piece of flex. This latter is the negative to which is attached a small combined plug and socket.

Thus it is but a moment's task to connect any number of the batteries in series or parallel or in series-parallel arrangements. White terminal indicating tablets are let in the top of each battery. There is also a large capacity type which should prove useful for running ·1 or ·06 valves. It is stated that it will operate one ·06 valve or lamp for fifteen hundred hours.

SOME LISSEN COMPONENTS.

The Lissen headphones are the lightest and most comfortable telephone receivers we have had the pleasure of donning within our memory. And one screw on each of the two light earpieces enables the headphones to be instantly set at the best position and locked there with the one movement. Again, when wearing these Lissen 'phones one can sit right back in one's chair, for a specially long and light lead is provided.

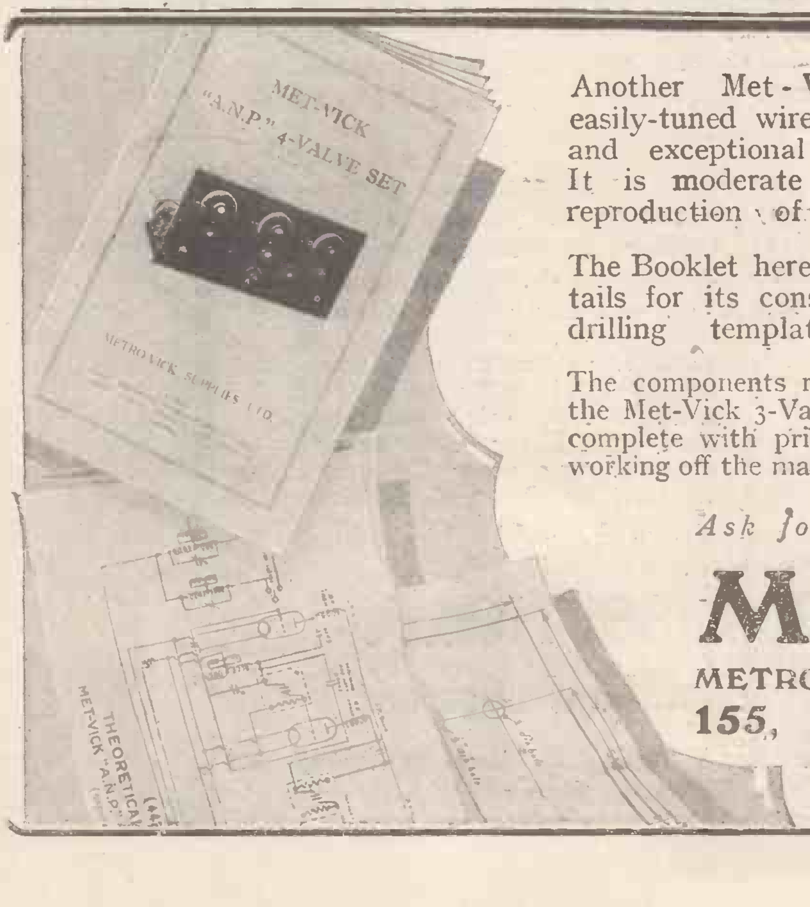
The earpieces are undoubtedly most sensitive, but they are made to appear almost abnormally so owing to an arrangement of four holes in each cap through which sound is projected direct into one's ears from almost the entire surfaces of the diaphragms. Tone is good and the 'phones respond equally well to either very weak and very loud signals, even though no adjustments are provided, the absence of which, in the circumstances, is a commendable feature of the instruments. They are well made, neat, and attractive in appearance, and are as good as anything Lissen's have produced, and that is saying something.

The Lissen two-way coil holder almost bristles with good features. In its design and production it is Lissen at its best. It incorporates a friction gearing which could not be improved upon for the purpose. The movement is entirely free from backlash or harshness, and has just that right amount of smooth resistance which we so often look for in vain in the adjustment of a component of this nature.

The long spindle and large milled knob can be reversed in quite a simple manner in order to make the moving-coil holder operate on the left hand side should this

(*Continued on page 856.*)

The Met-Vick 4-Valve A.N.P. Constructor Set



Another Met-Vick sensitive, simply-constructed, easily-tuned wireless receiver having great stability and exceptional selectivity on all wave-lengths. It is moderate in cost and gives loud-speaker reproduction of high quality without distortion.

The Booklet here illustrated, No. 7117/5 gives full details for its construction, and is complete with a drilling template and two wiring diagrams.

The components required are similar to those used in the Met-Vick 3-Valve Local-Daventry Set, and are given complete with prices in the booklet. A similar set for working off the mains is described in Booklet No. 7117/4.

Ask for them at your local dealers.

MET-VICK

METRO-VICK SUPPLIES LIMITED
155, Charing Cross Road,
LONDON, W.C.2.

R
P99

RADIO
IGRANIC
DEVICES

Each the leader in its class

IGRANIC L.F. TRANSFORMER, TYPE "G"

In designing this transformer the object was to obtain equal amplification of all the essential notes of the musical scale *under working conditions.* The measurements made by the National Physical Laboratory effectively demonstrate the remarkable success obtained.

Perfect curves obtained under ideal laboratory conditions are useless for giving an idea of the transformer's performance when placed in an average receiver, and this fact should be borne in mind when comparing the curves of the Igranic "G" Type Transformer with others.

A leaflet giving curves and full particulars will gladly be sent on request.

It is made in two ratios, 3·6 : 1 for first and single stages (with 20,000-30,000 ohm valves), and 7·2 : 1 for second stage (with low impedance valves). Two 3·6 : 1 ratio transformers may be used if desired.

Price 30/-

Backed by an unique experience in low frequency transformer design and aided by the resources of the Igranic Electric Co., Ltd., the Igranic Engineers set out to design two transformers, the best at a popular price and the best at any price. That they have been outstandingly successful is evidenced by the demand for the "F" and "G" Type L.F. Transformers, the former undoubtedly the best medium-priced transformer on the market and the latter the nearest to perfection.

Write for List No. R.69—it gives full particulars and will aid you in your selection.

IGRANIC L.F. TRANSFORMER, TYPE "F"

This Transformer is a development and improvement on the famous "E" Type Transformer. Its external appearance is the same, but internally it contains many improvements suggested by experience which increase its efficiency, reduce the cost of manufacture, and thus make possible its very reasonable price.

It can be relied upon to give good quality results with freedom from breakdown when used under the recommended conditions. One ratio only is made, i.e., 3½ : 1, the transformer functioning equally well in either first or third stages.

Price 16/-

**IGRANIC
ELECTRIC CO., LTD.,
149, Queen Victoria Street,
London, E.C.4.** Works: **BEDFORD.**

Branches: BIRMINGHAM, BRISTOL, CARDIFF, GLASGOW, LEEDS, MANCHESTER, NEWCASTLE.

THAT WIRELESS SET

you are constructing CANNOT BE a really NEAT and DURABLE one WITHOUT THE AID OF a

BRITINOL "POPULAR" SOLDERING OUTFIT

The "BRITINOL" SOLDER contained therein does not require the use of a separate flux as the flux is combined with the solder, and, furthermore, it is of a non-corrosive nature.

THE OUTFIT CONTAINS: 1 spirit blow lamp, 1 telescopic soldering iron, 1 tin self-fluxing paste solder, 1 coil self-fluxing wire solder, 1 extra pair wicks for lamp.

From your dealer at **7/6** complete or direct from us at 8/- post free.

BI-METALS LTD. **Sugar House Lane,
LONDON, E.15.**

FREE!

To advertise the Eagle Electric Irons we are giving away one free with each of the first ten orders we receive each week for a

CHAKOPHONE WIRELESS SET

which is complete in every detail and includes a free insurance policy.

10/- per month for valve sets, no deposit.

Radio Dealers can supply on our H.P. terms.

For free Booklet write your name and address on the back of this advertisement and send in ½d. stamped open envelope to:—

**EAGLE H.P. RADIO (P.W.),
45, Pall Mall, London, S.W.1.**

APPARATUS TESTED.

(*Continued from page 854.*)

be desired. It should be noted that either a standard or a long spindle type can be provided. Another good point is that the four terminals are permanently mounted on the base so that the necessity for flexible connections does not arise.

The Lissen Mansbridge type fixed condenser of the high-voltage class is tested at 1,000 volts D.C. It is, of course, designed for incorporation in mains units. As we write we have one of 4 mfd. capacity in front of us, and this we have just tested and found to be quite satisfactory. But constructors should note that the casing is of rather brittle material, and that the feet of the component are liable to break easily. This small criticism, if such it can be called, is notable in that it is the first one we have had occasion to bring against a Lissen component for a very long time!

TWO NEW DARIO VALVES.

Two new valves, which complete the series of Darios, were recently sent us by the Impex Electrical Ltd., of High Road, Leytonstone, E.11. These are both designed for resistance-capacity coupling, The Dario Resistron is one of the little bi-volters which, taking only ·05 ampere as filament current, operates at 1·8 volts, It is of the high mu type and has an amplification factor of 50 and an impedance of 150,000 ohms. The price is 7s. 6d.

The other Dario Resistron operates at 3·5 volts taking ·07 ampere of current. This has also an impedance of 150,000 ohms and an amplification factor of 50. The price, similarly, is 7s. 6d. We do not advocate the use of very high mu valves in L.F. positions, but as detectors preceding R.C. and in such H.F. stages, these Darios gave very good results, despite their low filament consumptions. The 5-volter, by the way, requires a filament current slightly exceeding ·05 for best results, except when it is operating as an anode bend detector, where it will function at slightly less. These Darios are remarkably small valves and are well turned out. They are made in France and are, in our opinion, equal to the best foreigners on the British market.

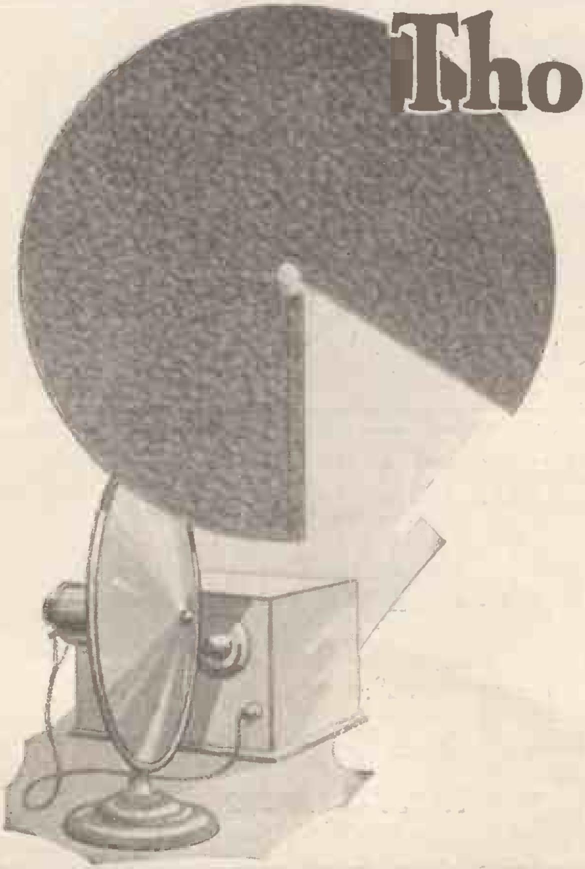
Dr. Brooke Nicholls, whose Coral and Pacific Island talks are a popular feature at 3 L O of Melbourne.
(*Photo Ruskin Studio, Melbourne.*)

SIFAM POCKET VOLTMETER.

There is now a Sifam Pocket Voltmeter specially designed to appeal to radio enthusiasts. It has two ranges, one of from zero to 6 volts and the other from zero to 120 volts. Two distinctively coloured contact points enable either range to be brought into use.

It is a very nicely made instrument and has carefully marked scales. Now these pocket meters are not generally particularly accurate and we have usually employed them merely as articles for providing useful indications of the condition of a battery, but within the limits of its fairly small scale this Sifam has a surprising accuracy.

Both on its upper and lower ranges the test sample gave dead readings down to about an eighth of a volt on the lower range, and to within a volt or two on the 120-volt range. For ordinary battery maintenance service this is all that is necessary. This Sifam also has the useful resistance of 4,000 ohms and is as good as anything of the kind we have yet tested in medium-priced meters. It is certainly just the thing for the pocket of the average radio enthusiast in more senses than one. The voltages of both H.T. and L.T. batteries must be closely watched if trouble-free radio reception be desired.



Thousands are using it!

Six-Sixty Cone Speaker Paper has been available to the Wireless enthusiast for only three months, and yet to-day, literally thousands of people are using this unique material for their Cone speakers. The reason for this tremendous demand is that no other Cone material is capable of reproducing with that wonderful degree of purity attained by Six-Sixty Cone Speaker Paper.

Why are people buying Loudspeaker units in their thousands? Because they know that for a moderate outlay they can, with the aid of Six-Sixty Cone Speaker Paper, construct a Speaker which will yield results as excellent as the most expensive types.

If you want a Cone Speaker which will certainly give you the purest and most natural reproduction possible, buy one of the well-known Loudspeaker units, together with a supply of Six-Sixty Cone Speaker Paper, spend a pleasant half-hour in constructing the Speaker, and THERE YOU ARE.

Six-Sixty Cone Speaker Paper is made in two sizes, 12 ins. diameter and 19 ins. diameter.

Prices **2/6** and **3/6**. *Brass Washer 3d. extra.*

If you have any difficulty in obtaining, write direct to us, enclosing your dealer's name and address.

THE ELECTRON CO., LTD., Dept. P.W.,
122-124, CHARING CROSS ROAD, LONDON, W.C.2.

A NEW AND DIFFERENT LOUD SPEAKER

THE EDISWAN ONE-DER LOUD SPEAKER

FULL SIZE MODEL

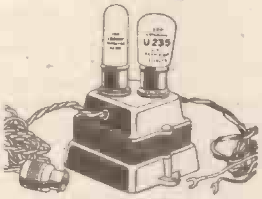
Coloured a deep brown tone, the ONE-DER is a speaker of such refined appearance that it will tone with almost any scheme of decoration.

Ask your dealer for a demonstration, or write to us and let us arrange it for you through a local dealer.

Fully licensed under Patent Nos. 239331, 243431 and 243432.

PRICE:

£2 . 10 . 0



If you have A.C. current you can charge your own batteries with the Ediswan Low Tension Accumulator Charger. Save time and money. Ask your dealer.

EDISWAN VALVES

CLEAREST-STRONGEST LAST THE LONGEST

A type for every purpose.

The Edison Swan Electric Co., Ltd.,
123-5, Queen Victoria St., London, E.C.4

THE NEW No 7

FOR ALL DRY BATTERY PURPOSES USE HELLESENS THE BEST IN THE WORLD
HELLESENS
WIRELESS BATTERY
"WIRIN"

RECUPERATING AGENT IN THE

HELLESEN

DRY BATTERIES

TO-DAY radio programmes extend from mid-day to midnight, and Hellesen H.T. Dry Batteries are built especially to stand the strain. They give uniform, silent H.T. supply at the minimum cost per hour.

Insist always on Hellesen Dry Batteries with the sealed cover and quadruple insulation.

60-volt	*"WIRIN"*	*12/6*
99-volt	*"WIRUP"*	*21/-*

(Postage Extra.)

All types, voltages, etc., in Double and Treble capacities for H.T. and L.T. Supply. Ask your dealer for the type to suit your set and get the maximum service, or write us for full particulars.

Obtainable at all Radio, Electrical and General Stores, Harrods, Selfridges, etc., or direct from

A. H. HUNT, Ltd. (Dept. 12), CROYDON, SURREY.

TRADE HUNTS MARK

They Last Longer

VOLUME
& PURITY
for XMAS
RADIO

Model No. 44.

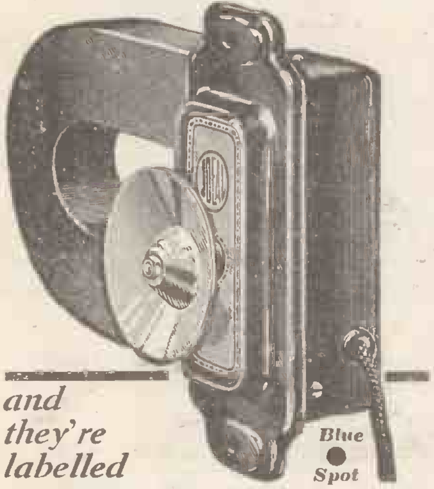
The IDEAL CONE LOUD SPEAKER

The driving unit of this fine cone speaker is the Ideal Four-pole Balanced Armature Driving Unit. This unit finally eliminates distortion and false resonances, and gives full, harmonious, and loud reproduction of music, song, and speech, and can cope with the highest energies. Very attractive in appearance. Can be used as a wall or table speaker.

Only £2 : 2s. Complete.

The IDEAL FOUR POLE BALANCED ARMATURE UNIT Only 25/-

There is no better driving unit for the basis of a cone type loud speaker than the Ideal patent Balanced Armature Unit. Special steel is used for the magnet. This enables a very powerful flux to be obtained, making the unit extremely sensitive. The armature is carefully damped to obviate all resonances liable to distort reception. Gives pure and powerful signals.



and they're labelled

Blue ● Spot

From all good dealers or direct:

F. A. HUGHES & Co., Ltd.
Head Office:
204-206, Gt. Portland Street, London, W.1.
Telephone: Museum 8630 (3 lines).
Manchester Office: 185, Princess Street.
Telephone: City 3369.

RADIOTORIAL

All Editorial Communications to be addressed to The Editor, POPULAR WIRELESS, The Fleetway House, Farringdon Street, London, E.C.4.

The Editor will be pleased to consider articles and photographs dealing with all subjects appertaining to wireless work. The Editor cannot accept responsibility for manuscripts and photos. Every care will be taken to return MSS. not accepted for publication. A stamped and addressed envelope must be sent with every article. All inquiries concerning advertising rates, etc., to be addressed to the Sole Agents, Messrs. John H. Lile, Ltd., 4, Ludgate Circus, London, E.C.4.

The constructional articles which appear from time to time in this journal are the outcome of research and experimental work, carried out with a view to improving the technique of wireless receivers. As much of the information given in the columns of this paper concerns the most recent developments in the radio world, some of the arrangements and specialities described may be the subject of Letters Patent, and the amateur and the trader would be well advised to obtain permission of the patentees to use the patents before doing so.

QUESTIONS AND ANSWERS.

SPILT ACCUMULATOR ACID.

T. C. (Chatham, Kent).—"My last lodger spilt some acid from an accumulator on to the floor and ruined the carpet. Isn't there any method of removing the stuff before it does this damage?"

You can "neutralise" the acid by powdering ordinary washing soda, and applying liberally a strong solution of this to the spilt acid. The stronger the soda the better. Do not be afraid to leave it "working" all-night, as to be efficacious it must penetrate at full strength to every place attacked by the acid.

As the latter acts quickly it is important to lose no time in neutralising it. If washing soda is not available, bi-carbonate of soda may be used, or ammonia.

TWO SETS, ONE LICENCE?

J. M. (Nottingham).—"So now we are going to have two sets in the one house. Do I need another licence?"

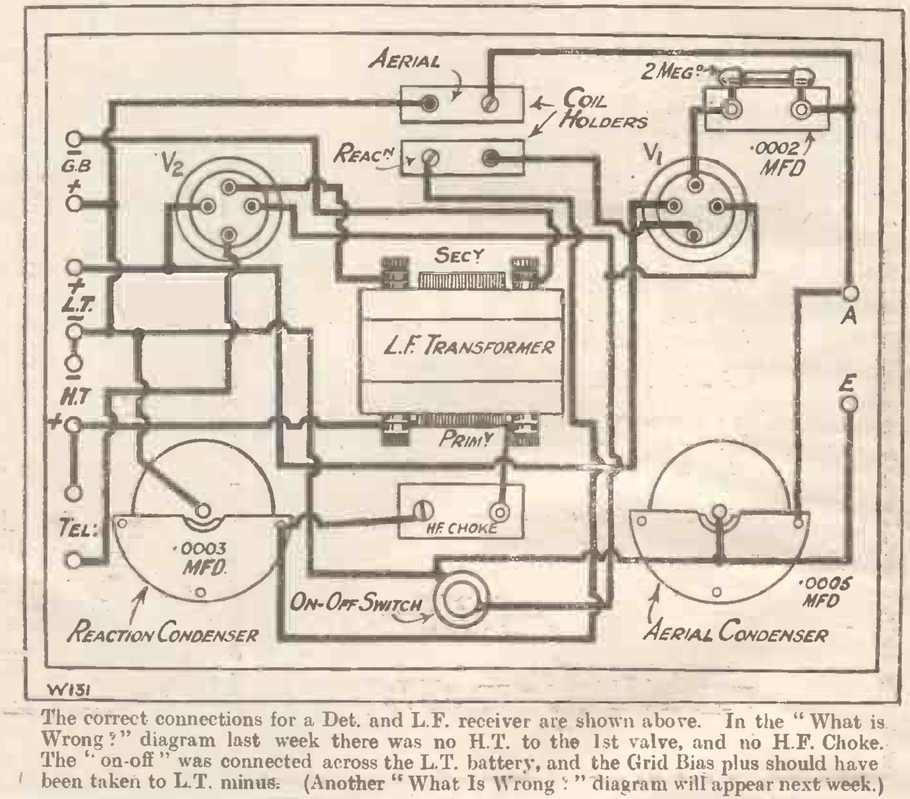
A wireless receiving licence entitles the licensee to use wireless apparatus in the premises occupied by him. One licence will cover any number of sets installed on the same premises for the use of the licensee, his family, or his servants. But it should be noted that if any other person occupying a portion of the same house under a separate tenancy desires to instal wireless receiving apparatus, he must take out a separate licence.

SWITCHING OFF H.T. and L.T.

L. P. (Poultry, London, E.C.2).—"I have an L.T. switch in my set. It is connected on one side to L.T. plus, and H.T. negative, and on the other side to filaments, but owing to the H.T. minus being still connected right through the L.T. battery and set, I lose quite a lot of H.T. juice through leakage. Can you give me particulars of a really simple switch

(Continued on page 860.)

A TWO-VALVE SET (DET. & L.F.)



The correct connections for a Det. and L.F. receiver are shown above. In the "What is Wrong?" diagram last week there was no H.T. to the 1st valve, and no H.F. Choke. The "on-off" was connected across the L.T. battery, and the Grid Bias plus should have been taken to L.T. minus. (Another "What Is Wrong?" diagram will appear next week.)

FOR ALL GOOD RECEIVERS

The Terminal which will give real Finish and Distinction to your Receiver. Beautifully finished and Bakelite insulated. Made in 30 different engravings.

Type "B" illustrated, sold in attractive carton carrying a year's guarantee. Price 9d. each.
Type "M" as type "B" but non-insulated. Price 6d. each.

Patented.

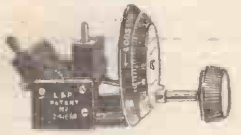
Illustrated catalogue free on request.

BELLING-LEE
TERMINALS

BELLING & LEE, Ltd., Queensway Works, Ponders End, Midlx.

Build the
"L. & P. 3·20 EXPRESS"

Price 10/6
Price without Slow-motion Dial 7/6



(3 Valves—20 Stations — Express Tuning.)

One-dial tuning—Razor-sharp Selectivity—Real Music—20 Stations on Loud Speaker—Cost of Components, £5 : 10 : 0, including the **L. & P. Two-way Coil Tuner.**

That's what you're looking for, isn't it? And it's a straight, quick job for any beginner.

This amazing simple circuit is becoming the rage of the season, and is already the envy and despair of H.F. screening and neutralising devotees.

Free Constructional sheet and wiring diagram. If your dealer cannot supply, we will send you copies post free. Mention your dealer's name in applying.

LONDON & PROVINCIAL RADIO COMPANY LTD., COLNE, LANCS.

The L. & P. Variohm—the finest Resistor money can buy — is included in above estimate.

Zero to 10 ohms, Scaled, with off position .. 4/-

REFINEMENT L&P IN RADIO

Getting better results from 2 volts

When we say that B.T.H. Nickel Filament Valves are superior to other 2-volt valves, we are not referring merely to subtle improvements in construction or characteristics. We mean that the new valves give results, which, to the average listener, as well as to the critical expert, *are quite obviously better* in volume, tone and length of service, than those given by any other 2-volt valves. To get the very best from your 2-volt accumulator you must use Nickel Filament Valves. But don't take our word for it. Try them in your set. You will be delighted and astonished at the wonderful improvement in reception—a result that will more than justify the cost of the change.

B 210 H	B 210 L	B 215 P
R.C. and H.F.	*General Purpose.*	*Power Amplifying*
Fil. Volts 2	Fil. Volts 2	Fil. Volts 2
Fil. Amps. 0.10	Fil. Amps. 0.10	Fil. Amps. 0.15
Max H.T. Volts 150	Max H.T. Volts 120	Max H.T. Volts 120
10s. 6d.	10s. 6d.	12s. 6d.

The above prices are applicable in Great Britain and Northern Ireland only.

B T-H
VALVES
NICKEL FILAMENT

Made at Rugby in the Mazda Lamp Works

The British Thomson-Houston Co. Ltd. 2871 A

A
PEERLESS
COMPONENT

THE PEERLESS NEUTRODYNE CONDENSER

This component is neat in design and robust in construction. Rotation of an ebonite knob causes a circular brass plate to move towards or away from a fixed circular brass plate attached to a disc of insulating material. Contact between the two plates is prevented by means of a thin insulated disc placed between them. The fixed plate is attached to the centre of an insulated washer, the latter being held in position by a neat metal case which encloses the plates. A metal sleeve is attached to the case, and in conjunction with a nut provides a means of fixing the component to the panel after drilling a single hole.

On test the minimum capacity was found to be 3 micro-microfarads, while the maximum capacity was 22 micro-microfarads. This is a satisfactory range of capacities for neutralising all types of receiving valves.

Panel Mounting	2/6
Baseboard Mounting	3/-

THE BEDFORD ELECTRICAL AND RADIO CO., LTD.,
22 Campbell Road, BEDFORD.

LONDON:
21 Bartlett's Buildings,
Holborn Circus, E.C.4.

GLASGOW:
113 St. Vincent Street,
C.2.

RADIOTORIAL QUESTIONS AND ANSWERS

(Continued from page 858.)

to cut out in one movement both batteries? I can do it with an elaborate switching arrangement, but probably there is a much simpler arrangement.

"I think this is something that is wanted badly, because I often hear people saying H.T. accumulators don't give half their rated capacity, and it is generally through not disconnecting H.T. every night. It wants a switch because the average man will not trouble to disconnect the leads themselves."

To cut out both batteries there are two distinct operations to be performed by the switch, namely, disconnect H.T. negative from the L.T. battery plus, and also disconnect the L.T. battery plus from the filaments.

This means that a double-pole single-throw switch (or its equivalent) can be used. It should be connected near to the battery terminals, and we will call its centre terminals 1 and 2, and the corresponding outer contacts A and B.

To wire up, join 1 and 2 together and to L.T. plus only. Join A to H.T. negative. Finally, connect B to the filament lead. When the switch is off, L.T. plus is joined to the centre contacts of the switch only. H.T. negative is joined to one of its "outer" terminals, and the filaments to the other "outer" contact. When the switch is "on," all connections are as formerly.

"P.W." TECHNICAL QUERY DEPARTMENT

Is Your Set "Going Good"?

Perhaps some mysterious noise has appeared and is spoiling your radio reception?—Or one of the batteries seems to run down much faster than formerly?—Or you want a Blue Print?

Whatever your radio problem may be, remember that the Technical Query Department is thoroughly equipped to assist our readers, and offer an *unrivalled* service.

Full details, including a revised scale of charges, can be obtained direct from the Technical Query Dept., "Popular Wireless," Fleetway House, Farringdon Street, London, E.C.4.

A postcard will do: On receipt of this an Application Form will be sent to you free and post free, immediately. This application will place you under no obligation whatever, but having the form you will know exactly what information we require to have before us in order to solve your problems.

CONDENSERS "IN PARALLEL."

S.R.L. (Warrington).—"I have two spare fixed condensers on hand, one ·0002 and one ·0003. If I connect one across the other, is that "in parallel," and, if so, what is the capacity of the pair?"

When one wire is connected to one side of both condensers, and another wire to the other sides of both, they are "in parallel." And their total capacity is the sum of the separate capacities. In the case named this will be ·0002 mfd. + ·0003 mfd. = ·0005 mfd.

THE MORSE CODE.

"Nautical" (Epsom, Surrey).—"I want to become a wireless operator, and I understand that to do this I shall have to learn telegraphy. How long would it take to learn the Morse code?"

It only takes a day or two to memorise the Morse code, but it takes a year or so to make a good telegraphist. For the expert operator not only knows the Morse code, but he can rattle it out on a transmitting

(Continued on page 862.)

Our New Popular Sets

are Extraordinary Value

Such handsome well-made receivers have never previously been offered the wireless public at such extraordinarily low prices. Quality has not been sacrificed and the component parts are of the highest grade ensuring extremely satisfactory reception, indeed the range and volume of the 3-valver has surprised many H.F. adherents. The slow motion control and S.L.T. Condenser ensure fine Tuning, there are no loose coils, the change from average to long wavelength being effected instantaneously by a switch. The oak cabinet contains not only the valves, but all batteries so that neatness of appearance is a pronounced feature. These sets are guaranteed twelve months and can be confidently recommended.

PRICES (Set only)

2-valves	£5 : 0 : 0
3-valves	£6 : 14 : 0

(Excluding Marconi Royalty).

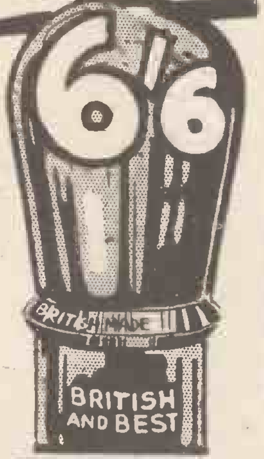
LAMPLUGH
BRITAIN'S BEST RADIO
"LAMP-LOO"

S. A. LAMPLUGH LTD.
King's Road, Tyseley, Birmingham.

Representative for London and Southern Counties: G. C. Shore & Co., 28, Newman St., Oxford St., W.1.

SEND FOR LISTS OF OUR HIGH-GRADE COMPONENTS

The CHEAPEST VALVE IN THE WORLD



Better results — lower filament current used — longer and more satisfactory service—**NON-MICROPHONIC. ALL BRITISH**—greater clarity and better reproduction.

3 DAYS FREE TRIAL

Money refunded in full if valves purchased are returned to us within three days.

TYPE H.F., L.F. & R.C. 2, 4 and 6 volt. All 0·1 amps. [Post Free.] **6/6**

TYPE POWER 2, 4 and 6 volt. 0·25, 0·15 and 0·1 amps. respectively. (Post Free.) **9/-**

Fill in the name of the Company on all Postal Orders and cross "& Co."

Beriton

MERCHANT MANUFACTURERS CO., LIMITED.
20, Bartlett's Buildings, Holborn Circus, London, E.C.1.
(Trade Enquiries Invited.) *'Phone: CITY 1469*
Callers served at 23, Bartlett's Buildings (Basement).

Heaps of Jolly Music for Xmas

Think of the many jolly hours this Brownie 2-valver would bring. Imagine the different programmes you could listen to, seated at your own fireside! Amazing loudspeaker clarity on all wavelengths. Get it ready for Xmas. Write for Booklet "Wireless without Worry."

50/-

Very well finished, handsome appearance, complete with two coils—but without valves. Marconi royalties extra.

The BROWNIE WIRELESS 2-VALVER ®

BROWNIE WIRELESS COMPANY (G.B.) LTD.
NELSON ST. WORKS, MORNINGTON CRESCENT, LONDON, N.W.1

MAKE YOUR OWN CONE SPEAKER

TWO WONDERFUL UNITS AT ONLY 15/- EACH

YOU'LL BE SURPRISED!

The New Wonder "Nightingale"

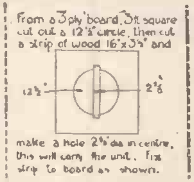
CONE UNIT

AS FITTED TO OUR CABINET CONE

GRAMOPHONE ATTACHMENT

with 4-inch diaphragm.

AS FITTED TO OUR £6 POST HORN.


From a 3 ply board, 3ft square cut out a 12½" circle, then cut a strip of wood 16" x 3½" and
12½"
2⅛"
make a hole 2⅛" dia in centre, this will carry the unit. Fix strip to board as shown.

BULLPHONE DOUBLE PAPER CONE 2/-
Postage 3d. extra.
Exactly as fitted to our own Speakers.

Reduced from 32/6 to 15/- solely as an advertisement for the famous Bullphone Nightingale Loud Speakers. Cobalt Magnet guaranteed for all time.

Astonishing Results, *equal to the most expensive Loud Speakers yet made, are guaranteed with either of these Units.*

10/- DEPOSIT BUY ON EASY TERMS 5/- DEPOSIT

CABINET CONE

Size 17 ins. high by 15 ins., in Mahogany, Walnut or Rosewood finish.

77/6 cash, or EASY TERMS 10/- deposit and 12 monthly payments of 6/-

21 ins. high, with 14-inch Bell, Mahogany finished, with plated arm and stand.

DE LUXE

57/6 cash, or 5/- deposit and 12 monthly payments of 5/-

SEND DEPOSIT NOW—NO REFERENCES—SPEAKER BY RETURN.

SATISFACTION GUARANTEED OR MONEY REFUNDED.

Obtainable from your local dealer or direct from:—

Bullphone Ltd.

38, HOLYWELL LANE LONDON, E.C.2 Regd
NIGHTINGALE SPEAKERS

Plantations and Panels.

4. The long, thin rubber sheets are now dried

WHEN the powerful roller machines have expressed all impurity from the rubber, the long thin sheets are hung up to dry, where they are left for some time preparatory to shipment.

If a sheet of this rubber contains the slightest flaw or impediment it is never shipped for the manufacture of Resiston Panels. That is why, if you examine the Resiston Panel which your Wireless Dealer will show you, you will find no blemish to mar its beautiful surface. That is why you will marvel at its great strength. Why you will appraise its rich colouring—as fresh after months of use as when you buy it. That, too, is why Resiston's insulation is so perfect, and why its dielectric constant is so low. That, in short, is why Resiston is the perfect panel. Ask your Dealer—he knows.

Resiston Panels come in 13 stock sizes in Black and Mahogany-grained. From 6 in. x 9 in. in Black, 3/5, to 8 in. x 30 in. Mahogany-grained 19/-.

RESISTON PANELS

"24 hours Cut Panel Service"

Advt. American Hard Rubber Co., Ltd., 13a, Fore St. E.C

CA 1208

RADIOTORIAL QUESTIONS AND ANSWERS

(Continued from page 860.)

key at the rate of thirty words per minute; and if he is receiving he can not only read thirty words a minute coming in the 'phones, but he can write it down legibly.

Before such speed can be attained plenty of practice is essential, so that the time it takes to learn is really dependent upon how much practice one is going to put in day by day. Unless you know an expert telegraphist who will undertake to teach you it will be necessary to undergo a course of training at some telegraphic school or college. (As well as being an expert telegraphist, the wireless operator has to pass an examination in the working of a ship's wireless apparatus, and this instruction, also, is generally best received at a wireless training college.)

CHOOSING THE LOUD SPEAKER.

D. S. (Leamington).—" Before I buy a loud speaker I would like you to tell me which you consider is the very best one on the market at the moment for tone and value for money ? "

We should like to be able to help you, but, unfortunately, the choosing of a loud speaker is very much like the choosing of a wife! It can only be done for one's self. The " value " to you will depend upon how much money you can afford to spend, and upon how keen is your musical appreciation, neither of which we know anything about. Similarly, the " tone " of the instrument is essentially a matter to be decided personally, for the tone that one person likes may not please somebody else. (The nearest approach to loud-speaker perfection is generally admitted to be the Rice-Kellogg type of speaker, but as this is expensive, and may cost up to fifty pounds, most listeners have to be content with one of the cheaper loud speakers which, although not perfection. are capable of giving amazingly faithful reproduction.)

THE WORK OF A DETECTOR.

CHARLIE (Rochdale, Lancs).—" Why can't I hear by joining a pair of 'phones between the aerial and earth ? It's the 'phones that turn the waves to sound, and it's the aerial that picks up the waves, isn't it ? "

We are afraid, " Charlie," that you didn't read the " Series for the New Amateur " which appeared recently in " P.W." In that series it was explained that there are high-frequency currents and low-frequency currents. It is quite true that the aerial picks up waves, but as these waves are caused by currents that are hopping up and down the aerial about a million times every second, it would have to be an uncommonly good pair of 'phones to keep in step, wouldn't it ?

And even suppose you managed to get hold of a specially invented super pair of 'phones, and they could and *did* respond to high-frequency aerial currents, you wouldn't enjoy listening with them because the human ear can't hear or " receive " such a frequency. It " cuts off " at anything above about 30,000. and therefore your eardrum wouldn't be able to pick up what those impossible telephones were sending out.

(Continued on page 864.)

Voltage at low cost

Daimon batteries provide voltage at low cost—a generous unceasing effort of power, a clean noiseless H.T. current to your grid—improving your loud-speaker reproduction, eliminating crackle and ensuring volume.

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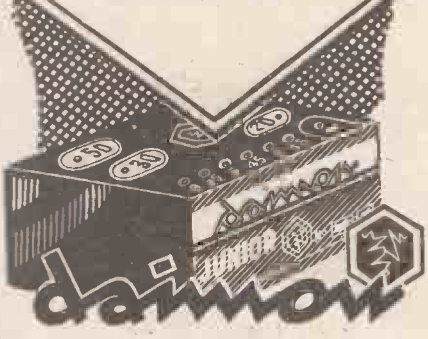
9 volt grid bias .. .. 1s. 10d.

DAIMON JUNIOR

60 volts .. .. 7s. 11d.
100 volts .. .. 12s. 11d.



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Two required for each hole

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NUMBER	0	1	2	3	4	5	6
Hole in Bush	6BA,	4BA,	2BA,	¼",	5/16",	⅜",	7/16"
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TRADE SUPPLIED.

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Type	Fil. Vts.	Fil. Amp.	Imp. Ohms.	Amp. Fac.	M/C	
206h	2	·06	35,000	15	·4	H.F.
206d	2	·06	25,000	12	·43	Det.
206l	2	·06	18,000	8	·44	L.F.
206rc	2	·0	120,000	40	·33	R.C.
215h	2	·15	40,000	20	·5	H.F.
215l	2	·15	30,000	15	·5	Det.
215l	2	·15	12,000	6	·5	L.F.
406h	4	·06	23,000	15	·65	H.F.
406d	4	·06	19,000	9·5	·5	Det.
406l	4	·06	11,000	6	·55	L.F.
406rc	4	·06	120,000	40	·33	R.C.
Power	2V	·20	6,000	5	·82	P.
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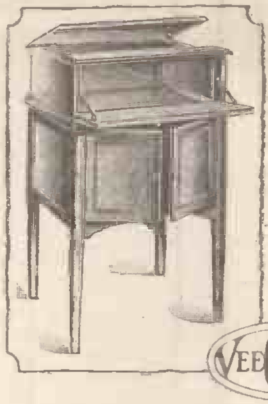

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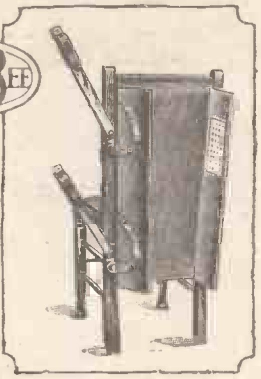

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are now available in Great Britain. They have been a full success on the Continent, and will, no doubt, be equally favoured by the British public.

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Prices, Tested on 500 volts D.C.:
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Inquire for prices of Condensers tested at 1,000, 2,000 4,000 and 6,000 volts D.C.

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This is the Battery for You

It costs a *little* more—
But it lasts a *lot* longer.
It is much, much cheaper
In the end. Remember its name—

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ABSOLUTELY (Patent No. 265463) **PERMANENT.**
Take this copy of "Popular Wireless" to your Radio Dealer, and on showing him this Coupon (which must not be removed from the paper) he will supply you with an N.M.C. Detector, complete for easy panel mounting, with five years' guarantee, at half the usual price—that is, you need only pay 6d. instead of 1s. Obtainable from any high-class Radio Store, or direct from Messrs. N.M.C. Detectors, 30, Princes Parade, London, N.3. To Postal Customers. Please do not send this Coupon—just mention "Popular Wireless."

RADIOTORIAL QUESTIONS AND ANSWERS

(*Continued from page 862.*)

If you refer to the articles named (they ran from "P.W." No. 280 to No. 285) you will find that a detector—to change high-frequency into direct current—is really quite an indispensable part of a wireless set.

THE "PROGRESSIVE" ONE.

N. A. W. (Manchester).—"I am thinking of making the 'Progressive' One, and carrying on to the four-valve stage; but it seems to me that by using the tapped coil described, the aerial will have to be clipped to a fresh tapping for each change of wave-length.

"This is going to be very inconvenient, and when I have the four-valve set in a nice cabinet I shall not want to open this and dive into the interior every time I want a fresh station. Is there an alternative method of working the tapped coil?"

You misunderstood the instructions given. Once you have made the aerial connection to the coil which gives you the degree of sensitivity and selectivity to suit your local and aerial conditions, you need never vary the tapping again. It is a case of "once set, always ready." The variable condenser will then give you the tuning over the whole range of wave-lengths that the coil will cover.

EFFECT OF GRID LEAK ON GRID BIAS.

"Stumpy" (Sale, Manchester).—"There is one thing that stumps me about grid bias, and that is how the 3 volts, or whatever the adjustment is, ever gets on the grid *through the grid leak*. My last amplifying valve has a leak marked 3 megs.! Surely the presence of this leak in series cuts down the voltage of the grid battery?"

The presence of the grid leak makes no difference to the *voltage* applied to the grid (provided that the valve is properly biased).

For it is not until current flows that a resistance in series will cause an apparent voltage drop. And as no current should be allowed to flow between the filament and grid of your last valve there is no loss of voltage in the circuit, and consequently you can assume that 3 volts applied to the grid will "get there" even through a 3-meg. leak.

WET BATTERY HIGH TENSION.

H. C. (Blackpool).—"Is it really necessary to put insulation between every row of cells in a home-made wet high-tension battery?"

Yes, we should certainly insulate the different rows carefully or you will get trouble instead of voltage.

HOW MUCH H.T.?

R. B. A. (Conway, North Wales).—"For the resistance stage I shall use a D.E.H. 210 2-volter. Will 120 volts be too much?"

No; the maximum for this valve is 150 volts.

A CORRECTION.

The photograph which appeared in last week's "P.W." on page 757 was not of the Brandeset IIIA, as stated, but showed the IIIB model, which is priced at £8 5s. exclusive of royalties and accessories.

FREE

A BOOKLET (G.F.13/A), describing the high efficiency radio components which are used in every circuit of merit, will be sent on receipt of request to

G.F.13/A, GAMBRELL BROS., Ltd.
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2 v. ·06 amps. H.F. & L.F.
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4 v. ·25 " POWER
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THE proof of the pudding is in the eating. Not for nothing have the leading Radio technicians used T.C.C. Condensers in most of the successful Sets during recent years. Not for nothing have the foremost Set manufacturers followed suit. And now—not for nothing has Cossor specified T.C.C. Condensers for use in the famous "Melody Maker." The reason? Just that T.C.C. has been found, in use, to be the *utterly dependable* Condenser.

T.C.C.
Condensers

¶ T.C.C. Condensers come in all capacities—each one guaranteed up-to-the-hilt. Mansbridge from ·005, 1/8 to 10 mfds., 18/6. Mica from ·0001, 1/10 to ·3 mfd., 21/6.

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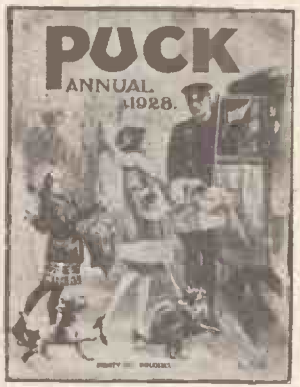

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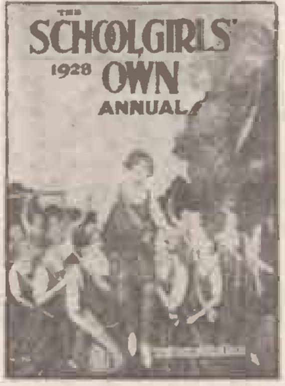

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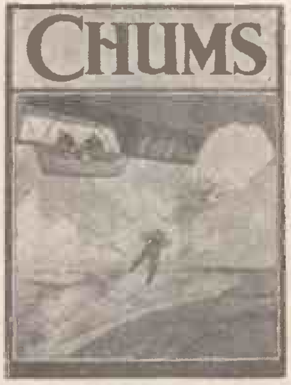

832 pages of grand reading. 12 colour plates, and everything that boys like best. 12/6 net

SHORT-WAVE NOTES.

By W. L. S.

THE first man to find a reliable method of forecasting reception conditions, particularly with regard to the shorter waves, will be doing what is probably the greatest service to radio since De Forest added the grid to the thermionic valve. It is, at the present time—and these remarks apply particularly to the last few weeks—utterly impossible even to gain the slightest inkling of whether conditions are to be good or bad in, say, two hours' time.

The lot of the amateur transmitter with low power who is anxious for some reason to get into touch with a station in, say, the United States, is a most unhappy one, for on some evenings the "N U" stations will be extremely strong as early as 8.30 p.m. and will all have disappeared by 11 p.m.; while on other occasions there will not be a sound audible at 10.30, and by the time the enthusiast is making tracks for his bed there will be distant stations in their hundreds mocking him!

It is not easy even to ascertain whether the variations in conditions are caused by variations in the weather, for while atmospheric conditions may affect only a comparatively small locality, the mysterious radio "conditions," as we have to call them for want of a better name, make their presence felt for 3,000 miles or more!

3 L O's Success.

The 20-metre band is by far the worst offender in this respect, while the broadcast band of 300–550 metres, although it seemed freakish enough in the old days, now apparently suffers few variations.

This is probably quite logical, for it is a generally accepted fact that the shorter waves penetrate further and further into the Heaviside layer before they are refracted sufficiently to emerge again, and certainly the longer the wave-length the greater the reliability seems to be.

Numerous readers have been kind enough to write to me and report reception of 3 L O, Melbourne, on about 33 metres. Several heard him on November 27th at about 19.20 G.M.T., when the transmission appears to have been very good, and others report reception of tests from 3 L O at various times. Congrats, 3 L O! May your power increase, or, in "ham language," may you QRO.

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INCHES
NOR IS
BEAUTY
RECKONED
BY RULE
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YOU
BUY LIFELONG
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IN EVERY
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OF

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Trolite panels are distinctive and can be obtained in the following varieties of beautiful finishes:

(1) Black Polished; (2) Mahogany Polished; (3) Walnut Polished; (4) Wavy Design; (5) Cube Design.

PRICES, per square inch:

Polished Black		Mahogany Walnut	Cube Wavy
3/16 in.	5/8d.	3/16 in.	3/4d.
1/4 in.	7/8d.	1/4 in.	1d.

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P1	6½d.	3/3	5/9	14/-
S1	6d.	3/-	5/3	12/-
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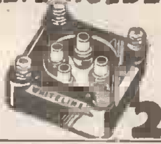

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RESISTANCE COUPLING. (2 volt. ·1 amps. 4 volt. ·06 amps.) 5/-
POWER VALVES (2 volt. ·2 amps. 4 volt. ·1 amps. 6 volt. ·1 amps.) 7/- EACH POST FREE
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Trade inquiries invited. Generous Terms.
If you are not satisfied your money refunded without question.
VAL VESCO, 128, CAMDEN RD., LONDON, N.W.1.

TECHNICAL NOTES

(*Continued from page 840.*)

Thumb-Control.

Thumb-control, which originated with the American designers of radio components, is now becoming more and more popular in this country. With this arrangement the dial of a condenser, for example, is placed in a plane perpendicular to the panel and protrudes slightly through a slot in the panel. It therefore serves not only as an indicator, but also as a means of adjusting the instrument. As this is obviously done most conveniently by moving the projecting part of the dial by means of the thumb, it is easy to see how the popular description of "thumb-control" has arisen.

One obvious advantage of this arrangement is that there is a considerable saving in the panel-space occupied by the dial, and also the appearance of the panel is much neater.

Ganged Condensers.

Another quite important advantage where two instruments are to be operated simultaneously (say, ganged condensers) is that the dials or control discs may be placed side by side in close proximity; it is then only necessary to place the thumb upon the control discs, which may then be moved simultaneously. Of course, if it is desired to move them separately, this also can readily be done.

Simultaneous Operation.

Talking about ganged condensers and simultaneous operation, which subject I also touched upon recently, there are, of course, other ways in which the simultaneous control may be obtained. Where several tuning condensers are to be operated together, they may be driven from the same shaft by a belt drive, and this renders it easy also to gear them in any desired ratio.

(*Continued on next page.*)

THE BOOKS THAT PLEASE.

Jolly Annuals for Schoolboys and Schoolgirls.

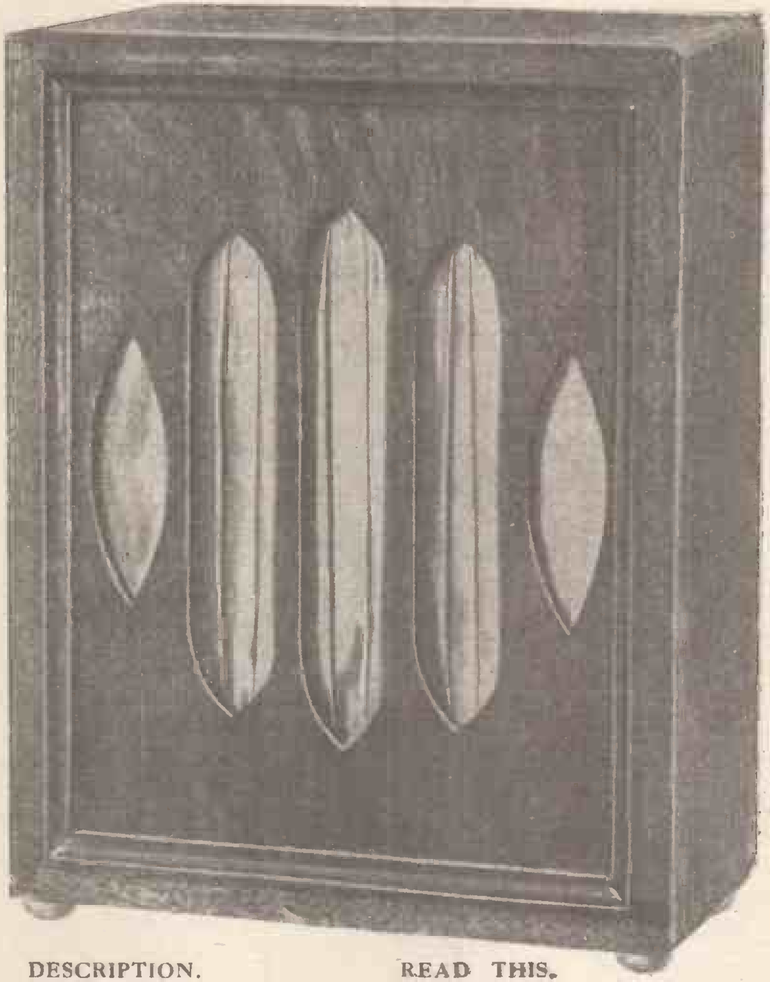
THERE is no better gift for the boy and girl of school age than a book and, unlike most other things, there is a very wide range of books available, all of which are certain to please. For the boy who likes adventure, there is the **CHAMPION ANNUAL** (6/-). Boys who delight in the adventures of the boys of St. Jim's, Greyfriars and Rookwood Schools will welcome **HOLIDAY ANNUAL** (6/-).

A "how-to-make" book of never-ending interest is the **HOBBY ANNUAL** (6/-), which deals in a new way with all hobbies. The **BRITISH BOYS' ANNUAL** (5/-) contains tales of school-life, mystery, sport and adventure.

Anyone seeking a gift at a higher price than these should select **CHUMS ANNUAL** (12/6), in which there are 832 pages of splendid reading matter and 12 magnificent coloured plates. There are 12 book-length stories dealing with school-life, football, cricket and adventure, in addition to a variety of other stories and articles.

For schoolgirls there are **SCHOOL FRIEND ANNUAL** (6/-) and **SCHOOLGIRLS' OWN ANNUAL** (6/-), packed from cover to cover with entertaining stories and articles; the **GOLDEN ANNUAL** (4/6), a story-book which will appeal to schoolgirls of any age, and **BRITISH GIRLS' ANNUAL** (5/-), with a delightful assortment of tales of school life, sport and adventure, together with entertaining articles.

Your *Ideal*
CONE Loudspeaker
Price
47/6
The "Beco" Popular Model



DESCRIPTION.

SIZE:—
11" High. 8" Wide. 4" Deep.
FINISH:—
High Class Solid Mahogany.
Adjustment at back of Cabinet.

READ THIS.

One of our well-known Wireless writers says:—
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Daily Press, Sept. 23rd, 1927.

Made under Patents owned and controlled by the British Electrical Mfg. Co., who now have the largest factory in this Country exclusively manufacturing Cone type Loud Speakers.

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Electradix Christmas Festoon Lighting only consumes a small amount of current and is easy to fix. Simply plug in to the nearest lamp socket.

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Motor Generators, D.C. to D.C., 220 volts to 8 volts, 1 amp., **£3 10s.**; 240 volts to 23 volts, 6 amps., **£7 10s.**; 30 volts to 400 volts, 100 millamps., **£4 10s.**; 240 volts to 23 volts, 6 amps., **£7 10s.**; A.C. to D.C., 240 volts to 50 volts, 4 amps., **£12 10s.**; 240 volts to 18 volts, 8 amps., **£8 10s.**; 200 volts to 20 volts, 15 amps., **£10.** High Tension Machines in stock for 600 volts, 1,000 volts, 1,500 volts, 2,000 volts, and 4,000 volts D.C.

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Meters, Meggers, Switchboards, and Control Gear of every description in stock.

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Electric Projectors, 25/- **Anode Converters,** 400 volts, £4 10s. **Charging Valve** Bargains; B.T.H., Cossor, etc., A.C. to D.C. 50 m., Sale 8/6. **Eliminators,** with Metre, **40/-.** **Switches,** 250-volt Tumblers, **6d.** 8-way Lucas for **3/6.** **3-in. Paxolin Tubes, 4d.** **Crystal Amplifying Units,** 2,000 ohms, 13/-. Buttons, 1/-. **Western Electric Loud** Speakers, 15/-. Violinas, 25/-. Sullivan Phones, 3/-. Single 1/6. Rubber Ear Pads, **4d.** per pair. **Gramo. Pick-ups, 21/-.** 16-Lamp Electric Festoons, 25/-. Gyroscopes, 15/-. **Mains Smoothing Chokes, 1/-.** 2-mfd. Condensers, 2/-. Remote Relays, **10/-.** Pushes, **6d.** **Sterling 1-Valve Amplifiers, 22/6.** 2-volt T.B. Amplifiers 32/6. **Inert Fuller,** 1½ cells, **1/-.** **4-range B21 Testers,** A.C. or D.C. 200 m/a, 4 amps. 6-volts, 120 volts, **40/-.** **Large Steel Horseshoe** Magnets, 3/6. **Bargain Sale of Marconi 1 Valve and Crystal Detector Sets,** as new, with valve, 20/-; cost £5.

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New Prices: Jars, 1/3. Sacs, 1/2. Zincs, 11d. Sample doz. (18 volts), complete with bands and electrolyte, 4/3, post 9d. Sample unit, 6d. 16-page booklet free. Bargain list free. AMPLIFIERS: 1-valve, 19/-; 2-valve, 30/-. 2-valve ALL-STATION SET, £4.—P. TAYLOR, 57, Studley Rd., Stockwell, London

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SCRAP your old crystal now and put new life, new power, and new tone into your set. Results will astonish you. From your dealer or direct, post free, from Dept. P., RUSSELL LABS, 138, Suffolk St., Birmingham. *World Distributors.*

the cost of only 1/6

THE NEW
STUTZBERG
THE SUPER NATURAL CRYSTAL

M.B.18

TECHNICAL NOTES.

(Continued from previous page.)

Filters.

A little time ago I spoke about the function of the condensers in an eliminator. As I have had several letters from readers on this point, it may be useful to refer to the matter again, as an eliminator power-supply device is not necessarily fool-proof and, like all other pieces of radio apparatus, it requires reasonable treatment.

The filter condensers used in H.T. eliminators should have proper di-electric to withstand the full voltage of the device throughout many years of service, and also to resist the occasional peaks or surges which may sometimes run to two or three times the maximum output voltage. It is a good plan, in fact, to employ filter condensers rated at twice the output voltage; that is, for a 200-volt maximum output H.T. eliminator the filter condensers should be of at least 400-volt working voltage rating, and so on.

The condenser nearest to the rectifier is subjected to the greatest electrical stress, since the current at this point is not entirely smoothed out, and therefore may have decided peaks in voltage. It is obvious that the first condenser in the H.T. power supply unit should have ample di-electric strength. If you are making up your own supply device and you have condensers of different di-electric strength or voltage rating, it is best to employ the highest rated condenser as the first filter condenser.

Two-Section System.

In the usual two-section filter system there are generally three filter condensers. The first one, that is the one nearest to the rectifier, is intended rather to maintain the output at a fairly steady voltage notwithstanding the changes in the load upon the instrument. It serves, in fact, for the regulation of the rectifier and does not have very much influence on the smoothing of the output of the device.

The second condenser acts as a smoother and, within reasonable limits, the larger the capacity of this condenser, in conjunction with the proper choke coils, the better.

The third condenser influences the tone quality at full volume.

COSSOR MELODY MAKER, 7/6 Post 6d.
Insist on COILS made by
Full lists 2d.
Made of the best materials obtainable, ensuring first-class results—don't buy dud coils.
RADIAX Ltd., Palmer Place, Holloway Rd., London, N.7

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IT is because of the peculiar fearfulness of injury or death by fire that those who fight it need a special form of valour.

One cannot, therefore, be accused of over-emphasis in speaking of the bravery of the fireman as of the very highest order; nor would there be occasion for very great surprise if the list of bravery during fire were a small one. But it is not. It equals, if not surpasses, the rolls of honour of the battlefield and the sea.

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Bi-duplex Wire-Wound Resistance Capacity Coupler. Type A.
Price 20/-

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Price - - - 15/-

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Master
Three

Illustrated descriptive leaflets C. 14 and 17—free on application—give full particulars and interesting circuits.
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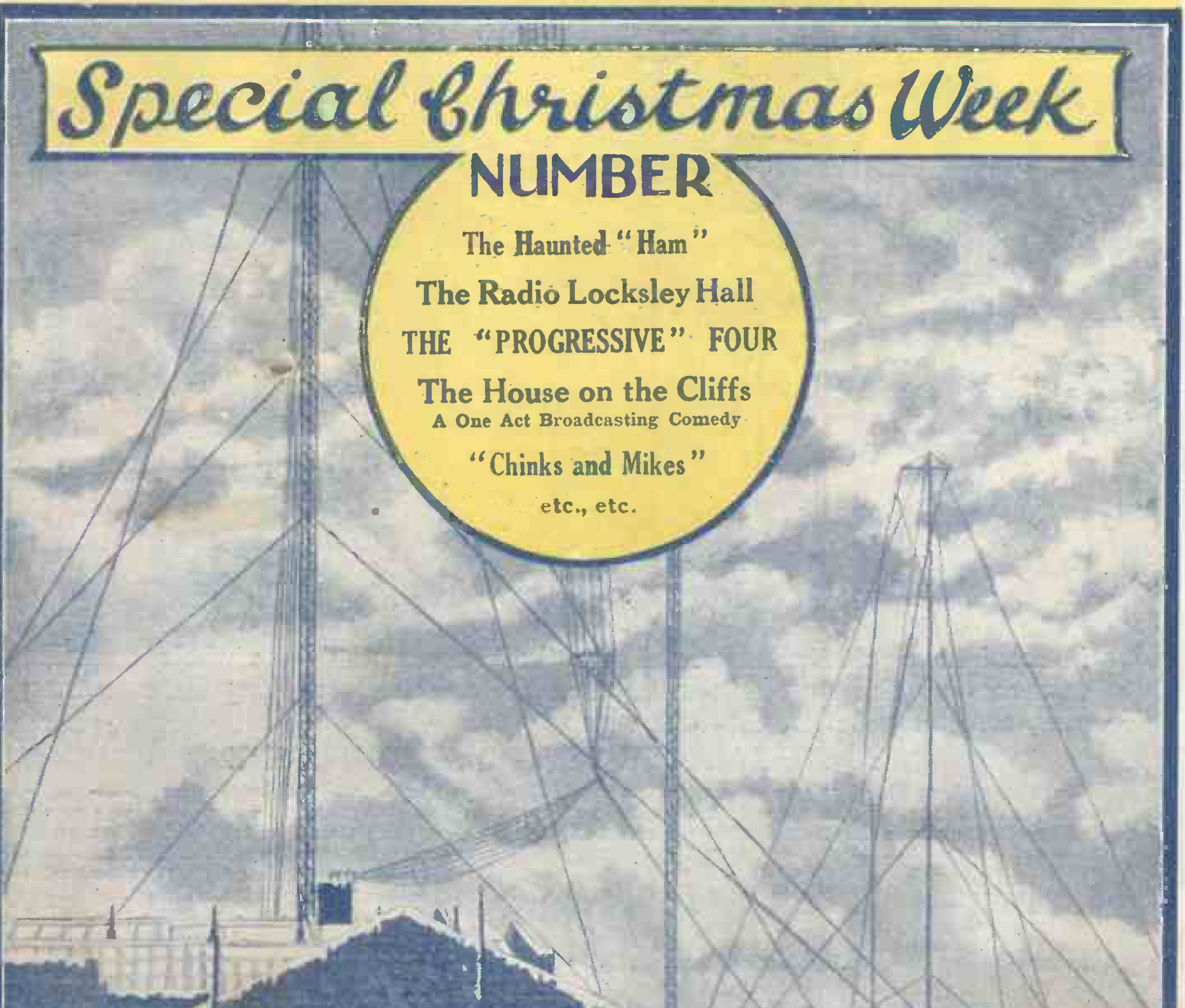

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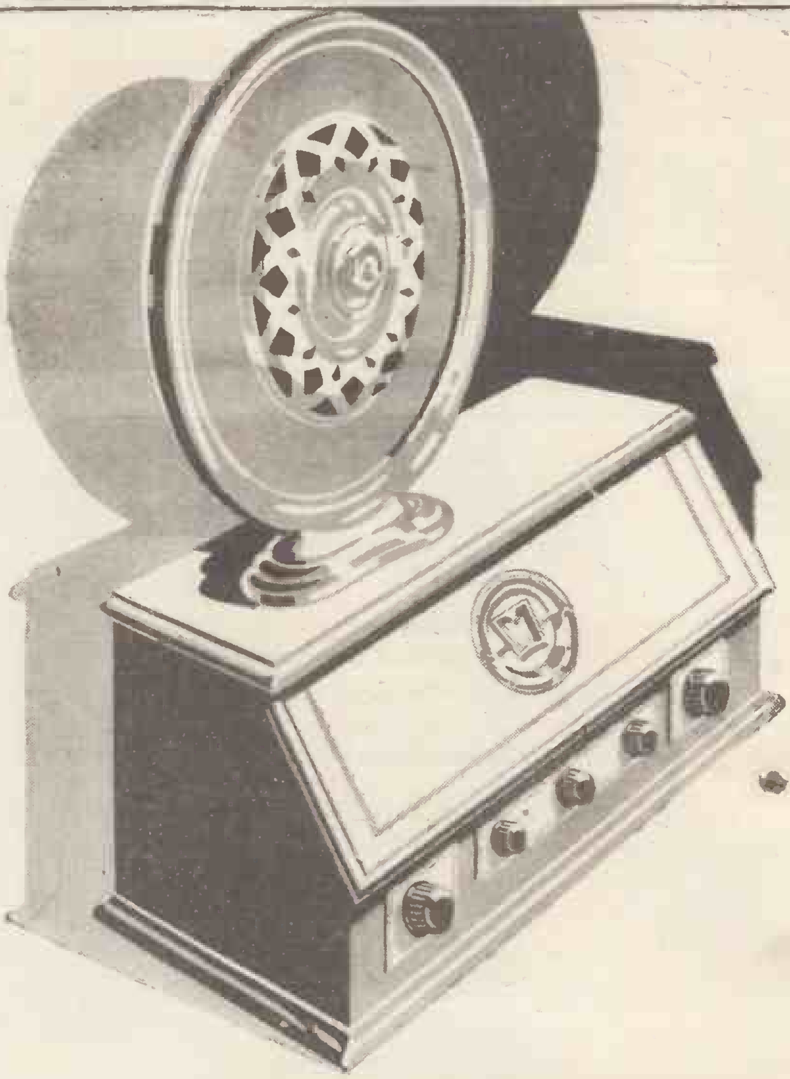

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THE Dubilier fixed condenser with its di-electric of best India Ruby Mica, is hermetically sealed into its bakelite case to render it absolutely immune from the effects of damp or dust.

Before being sealed, however, the condenser element is subjected to enormous pressure, immersed in boiling wax, and kept so rigidly clamped when assembled that the excluded air can never regain entry.

Finally the excellent bakelite moulding acts as an extremely high resistance and prevents losses through current "creeping" across between the terminals.

Years of experience and specialised craftmanship go to the making of this great little condenser; see that it figures prominently in every set you build.

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Types 610 and 620 (vertical):
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0.001 to 0.006 mfd., 3/-
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CATALOGUE AND PRICE LIST SEPTEMBER 1927
DUBILIER

All Dubilier Products are fully described in the catalogue shown here. In addition there is a lot of information which you may find interesting. If your dealer has run out of copies we will forward you one free.

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DUBILIER DICTA

No. 4.

Truly we progress in cycles.

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* * *

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* * *

When the small accumulator was sold mostly for running trembler coils on cars, perhaps it was legitimate to rate it at double its actual capacity. Now, when we want an accumulator for valve lighting, we are careful to see that the capacity is rated in terms of continuous, not intermittent, discharge.

* * *

There is another little matter in which it will pay you to exercise a spot of circumspection.

It concerns the practice of referring to Mansbridge Condensers in terms of their "test" voltages.

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You *may* be perfectly safe in working a Paper Condenser at half its stated test voltage; on the other hand you may find that it deteriorates rapidly at considerably less than this figure. It all depends upon what is meant by the word "test."

* * *

But after all, "test" voltages are things that mainly concern the manufacturer.

What *you* are interested in is the maximum voltage at which your Mansbridge will work in safety to itself and to your set or battery eliminator.

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Turn to the Mansbridge Condenser section of our catalogue (pp. 9 to 12) and you will find that for your convenience all condensers are referred to in terms of their safe working voltages.

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Advt. of The Dubilier Condenser Co. (1925) Ltd., Ducon Works, North Acton, London, W.3.

T.C.87.

Ashley Radio

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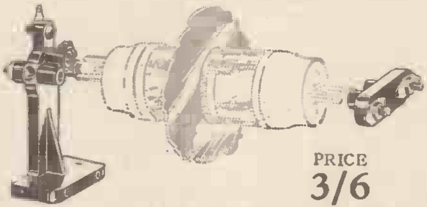

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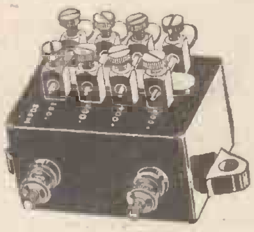

Although cheap enough to be incorporated permanently their main function is to determine the correct capacity of fixed condenser required in any specific circuit. Two ranges of capacity are made and capacities varying from ·0001 to ·0015 are obtainable in steps of ·0001 and similar variations are to be obtained with the second unit the minimum capacity of which is ·001. The acme of neatness and efficiency PRICE 5/6

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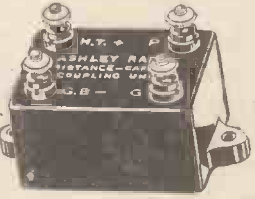

Made to suit the valves now marketed for R.C. circuits it is a first rate example of what can be accomplished by a careful study of up-to-date requirements in every direction. So far as can be determined it represents the best ideas in practice, the more remarkable in consideration of its compactness. The "A" unit suits all valves the impedance of which is less than 40,000 ohms and is recommended especially for the detector stage. For valves with an impedance value of over 40,000 ohms the "B" unit can be most effectively used.

PRICE 5/6 each.

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of TESTED CIRCUITS

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4.	CRYSTAL DETECTOR WITH L.F. AMPLIFIER.
5.	H.F. (Tuned Anode) AND CRYSTAL, WITH REACTION.
6.	H.F. AND CRYSTAL (Transformer Coupled, without Reaction).
7.	1-VALVE REFLEX WITH CRYSTAL DETECTOR (Tuned Anode).
8.	1-VALVE REFLEX AND CRYSTAL DETECTOR (Employing H.F. Transformer, without Reaction).
9.	H.F. AND DETECTOR (Tuned Anode Coupling, with Reaction on Anode).
10.	H.F. AND DETECTOR (Transformer Coupled, with Reaction).
11.	DETECTOR AND L.F. (With Switch to Cut Out L.F. Valve).
12.	DETECTOR AND L.F. UNIDYNE (With Switch to Cut Out L.F. Valve).
13.	2-VALVE REFLEX (Employing Valve Detector).
14.	2-VALVE L.F. AMPLIFIER (Transformer Coupled, with Switch to Cut Out Last Valve).
15.	2-VALVE L.F. AMPLIFIER (Transformer-Resistance Coupled, with Switch for Cutting Out Last Valve).
16.	H.F. (Tuned Anode), CRYSTAL DETECTOR AND L.F. (With Switch for Last Valve).
17.	CRYSTAL DETECTOR WITH TWO L.F. AMPLIFIERS (With Switching).
18.	1-VALVE REFLEX AND CRYSTAL DETECTOR, with 1-VALVE L.F. AMPLIFIER, Controlled by Switch.
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22.	"THE GUARANTEED REFLEX."
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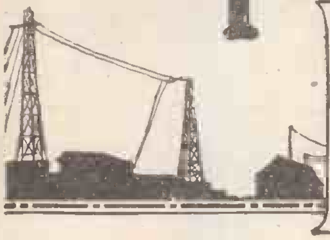

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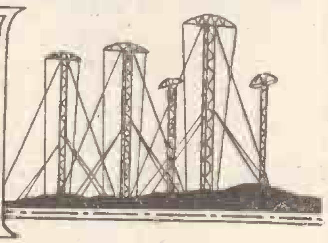


RADIO NOTES AND NEWS.

A Happy Christmas—"Ariel" Looks Back—Really Fireside Radio—Expanding Loud Speakers—That Chamber Music.

From Us to You.

ON Christmas Eve "P.W." sends this message to all its readers, to all who will be its readers, and to all lovers of radio: A happy Christmas and a prosperous New Year.

"Ariel's" Postscript.

YES, and may you be immune from oscillation, Morse, dyspepsia, run-down batteries, run-up bills, and Chamber Music. May the Pudding come out of its cloth sleek and whole, and the Turkey have eight legs. While I devour my miserable crust, I will think on you all with kindness. Friends, critics, and correspondents; Knights, Baronets, Peers: "Every Purpose Two"-ites, "Simmonds"-onians, Short-Wave Sheiks—mind you all have a Stout Old Time!

The Christmas Fare.

SOME of the Christmas items don't look too unbearable. I have marked down Mabel Constanduros' coming show from 2 L O as a "cert." Christmas Day being also Sunday, the attempt to provide special items results rather in a super-Sunday programme than in a Sunday-Christmas display, but Boxing Day looks promising. On December 23rd (to hark back a little), 5 G B will relay a Dickens Dream Phantasy from the "Brum" studio. Ought to be good!

"Ariel" Looks Back.

I HAVE special sympathy at this season for the professional wireless man, for his job takes him all over the world willy-nilly. The job has to be done, whatever the season. Just as he is gnawing at some fancy foreign grub and dreaming of turkey, stuffing, and sausage balls, lo! the aerial blows down or the nigger mechanic spills H_2SO_4 on the dynamo! I have had some.

For Instance.

THERE was that Christmas Day I spent on the Red Sea, *en route* to China. Plenty of the right kind of things to eat and drink, but four stokers died of heat and one passenger shot himself, leaving us with his wife and two lovely babies to comfort. Then that Christmas in Shanghai, when the mail from Vladivostok did *not* arrive and there was a little shooting in the French Concession, followed by a Chinese excution. And again, another joyous festival in Majorca, when I dined on half-raw pork sausages, washed down with priceless Lacrimæ Christi. Gentlemen, let us be glad that we are in England, with the right sort of folk and the old customs.

Really Fireside Radio.

MY recent note about the need I felt for the means of working my set without stirring from the fire brings a note from another "hardy Norseman" like myself, namely H. A. S. (Surbiton). Fifteen feet from his receiver, he can sit in his old cane chair, get chilblains on his toes by roasting 'em, and at the same time switch on his set, control the volume, and, in addition, change from 2 L O to 5 G B. Good! Now, H. A. S., I want to *tune* the set without shifting. Guess I'll have to move the set—or the fireplace!

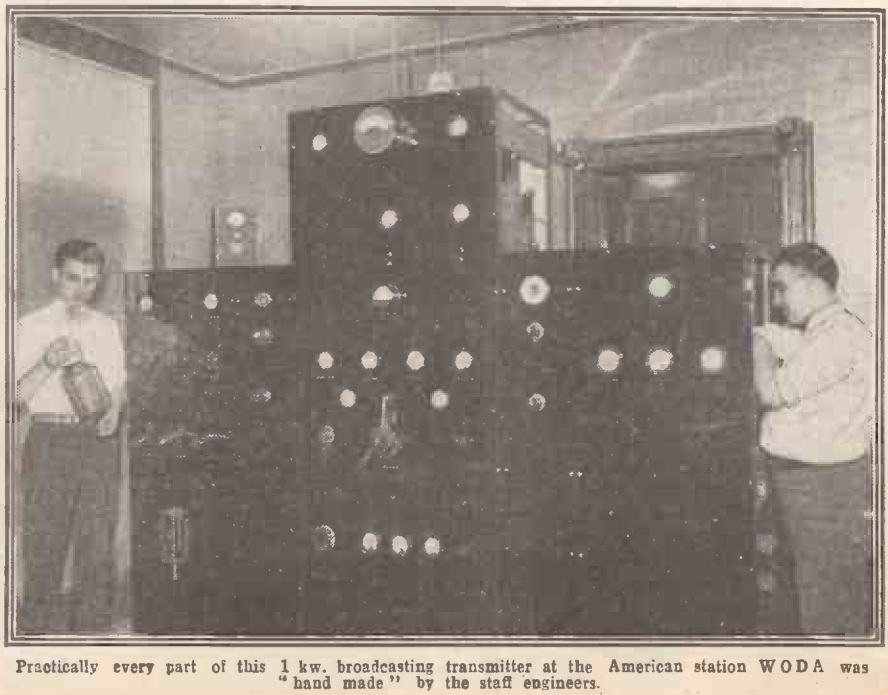
Familiarity Breeds Contempt.

THE terms used in wireless, once esoteric, are now household words, lisped by the baby and mimicked by the parrot. Radio sets are to be found in the most out-of-the-way places on earth, amongst cannibals, in Chinese huts and Indian wigwams. And yet—

Wireless Witchcraft.

ONLY seventeen years ago, when I tried to get a cook for a wireless station in a country not more than two days' journey from Charing Cross, I had the greatest difficulty in getting a native (European!) to live on the station, and then only got an orphan girl who, being disfigured by small-pox, considered herself immune from devilry and witchcraft of all kinds. But thereafter she was very unpopular amongst her countrywomen!

(*Continued on next page.*)



Practically every part of this 1 kw. broadcasting transmitter at the American station W O D A was "hand made" by the staff engineers.

NOTES AND NEWS.

(Continued from previous page.)

Expanding Loud Speakers.

AN observant reader sends me a cutting from a newspaper wherein an advertiser offers a four-valve set, "with accumulative loud speaker." The advertisement ends, "Room wanted." I suppose the poor fellow lived in a Council-built house, and the loud speaker had accumulated so much that the garage was pushed into the next "Avenue."

The Little Innocents.

I SEE that a Rotherham cadi, when inflicting fines on people for not having wireless licences said that the bench thought that it is not generally known that people must take out licences before they get their sets. I agree. It is not generally known. Nor is it correct to suppose that the licence must be procured before the set. But I believe that most folk know well enough that they must not own and work a receiver unless they are licensed to do so, and that 999 out of every thousand fines inflicted for non-licensed sets are jolly well deserved.

Radio in Japan.

SHORT-WAVE enthusiasts may remember that some time ago I promised to write to Japan for authentic and up-to-date information about short-wave broadcasting there. My correspondent dashes our hopes by replying as follows: "There is no short-wave broadcasting in Japan, nor is any such service contemplated, even experimentally." He has, however, given me such a complete picture of Japanese broadcasting that, with the Editor's permission, I shall shortly give readers the benefit of it in a special article.

That Chamber Music.

D. E. O. (Cambridge), whose kind wishes are reciprocated, has noticed my faint aversion to Torture-Chamber Music, and tells me that some people like it. I know! Some people like tom-tom music, and poison, and snakes. He goes on to say that he violently objects to a certain well-known dance band and the voice of a certain announcer at 2 LO. Well, D. E. O., I am with you there; but some people like them, you know. D. E. O. buys "P.W." because—*inter alia*—he does not agree with all of my opinions, and thus finds food for debate. My dear fellow, if I wrote truisms and platitudes, I should not write for "P.W." It's alive!

What's in a Name?

THERE'S a bit of a row on in the Esperanto world about the right word for valve. Some call it "lampo," others "valvo," "klapo," and "relajo." Well, if they will accept me as an arbitrator, I plump for "Bonzo."

Still They Come.

INVENTORS of wireless continue to appear. The most recent attempt to twist the facts was made by the Russian Soviet who produced Popoff as the first to send a message by wireless. This attempt was squashed. I now read in the periodical called "International Language" a letter from Mr. F. Ullver, of Czecho-Slovakia, in which he claims to have done wireless transmission in 1895. In order to show the need for an international lingo I will give an extract from his letter.

Discovery of Wireless.

MR. ULLVER writes: "I have read, that radio apparatus was invented by Russien prof. Popov. To that occasion it is my obligation to say, that by my study time in teacher-institute to 1895 I an my colleague Brunclik have mutually himselves understanding, each from one stead equipped with one battery. Rumkorf apparatus and a spool of wire drawer. . . . It was examined in Russland by wartime in the City Kazan." So that's that. Quite conclusive.

SHORT WAVES.

Instructions on how to perform conjuring tricks are now broadcast. We can imagine the bleak silence that will ensue when an optimistic Aberdeen child attempts to borrow a shilling to perform a trick.—"London Opinion."

* * *

SELECTIVITY.

A.: Can you cut out interference with your radio set?

B.: Can I? Why, when I put the earphones on I can't hear a word my wife says!

* * *

Complaints have been received, we understand, of a loud speaker playing continuously outside a London cemetery while funerals are in progress.

Maybe it's only one of the fans trying to disprove his neighbour's theory that his loud speaker is enough to awaken the dead.

* * *

Never give your neighbour the smallest of crystal sets, because later on he will be borrowing your loud speaker.

* * *

Bell: Have you had a radio long?

Bull: I've had one so long, I remember when we used candles instead of bulbs.

* * *

"Everything," says a writer, "will soon be done by wireless."

Cats are now eagerly awaiting the advent of the wireless canary cage.—"Sunday Pictorial."

* * *

Radio terms illustrated. An effective lead in: Policeman escorting burglar to cell.

* * *

EPITAPH FOR A DX HOUND.

Here lies interred, Josephus Byrd,
Who passed, from joy, away;
The station call that he last heard
Was 7 B Y—Bombay.—"Radio News."

Interest in 5 S W.

I AM getting a lot of letters about 5 S W, the experimental short-wave station of the B.B.C. at Chelmsford. First of all, to answer many of you simultaneously, 5 S W works at present on 24 metres, from 12.30 to 1.30 p.m. and 7 p.m. to midnight, daily, except Saturdays and Sundays. L. F. (High Holborn), W. F. B. (Pontypool), and W. S. (Tredegar) refer to the re-broadcast of 5 S W by 2 X A F. This long-distance reception of a station on this side is very interesting, and reminds me that on some of the beam stations they have received and recorded their own signals after the latter had been round the world.

Skip Distance.

DUE, no doubt, to "skip distance" effect, 5 S W is not generally well heard here. E. T. (Gloucester) has compared it with American stations, and found it wanting. R. W. S. (Little Wakering), who is a Valve Baronet, and user of the Simmonds 10-metres set, found little difference between 5 S W and 2 X A F. By the way, R. W. S. may look for a "P.W." Peerage, for on his 0—v—2 he logs 150 stations, 29 of them being in the U.S.A.

The Ruling Passion.

THIEVES recently got into Ongar school, dismantled an eight-valve set, and collared the parts. Then they went to the laboratory and gleaned more parts from another set. "P.W." feels slightly guilty about this, because it certainly does encourage its readers to "collect" and assemble radio components. My opinion, however, is that a local set broke down, probably in the transformers, and the devotees, having promised to give a demonstration, took the only possible course open to them, and borrowed a few odds and ends. Amongst gentlemen, this is nothing. Quite understood!

A Few Appreciations.

THE "P.W." "All-Wave," 0—v—1, in the hands of W. S. (Tredegar), brings in 2 F C at R4, and works as well without an aerial as with one. Many U.S.A. stations on loud speaker. A valve Baronet of the blackest ebonite! W. E. G. (Gt. Grimsby) clings to our "Every Purpose Two," which likewise gets 2 F C. The two-valver shown in our free blue print No. 31 has given B. J. (Rushden) all the loud-speaker results he wants, round Britain and Europe, besides some U.S.A. stations and 2 F C. Money's worth, eh?

Reinartz and Simmonds.

N. W. H. (Cosham), an eighteen-year-old worker, gets 2 F C as well as his uncle does, on a Reinartz 0-v-1. Stick it, lad! Some of the planets may be inhabited. J. E. M. (Ivor Heath) wants to know whether there is a better short-wave set than the "Simmonds," because if there is he is ready to debate the point. There are many imitators, dear sir, but there is something about a "P.W." set that leaves 'em stiff.

Proof Positive.

RECEPTION of 3 L O (on the "'P.W.' Every Purpose Two") by W. J. S. (Exeter) has received confirmation from that station in the shapes of a nice letter, souvenir programme, and photograph of the main studio. Any owners of five-valvers who may have been inclined to doubt the *bona fide* of some of our Valve Barts. may now rest assured that, ladies and gentlemen, there is absolutely no deception. *You* provide the apparatus: *we* bring the rabbit from the hat.

International Prefixes.

G. H. J. (Ceylon), who runs Radio 7 V X, complains that Ceylon has not been allotted a prefix, and asks us to place the matter before the authorities. I understand that the prefixes were suggested by the International Amateur Radio Union; hence G. H. J. should write to Mr. K. B. Warner, Secretary, I. A. R. U., Hartford, Conn., U.S.A., expressing his views and suggesting suitable letters for Cingalese call-signs. Application should then be made through the local Governor.

Change of Wave-length.

THE wave-length of 422 metres formerly used by Cracow is to be allotted to Katowitze, a new station of 10 kw. Cracow is now working on a wave-length of 500 metres.

Radio and Christmas

Special programmes will be "on the air" for Christmas, but are you sure of getting your share? If not, read this timely and "solemn" warning.

By P. R. BIRD.

ONLY a few days to Christmas! Only a matter of hours, and the finest festival of all will be in full swing!

Already a host of problems has arisen.

Has the mince been minced for the mince-pies? What Bird of Paradise shall we have for dinner—turkey, goose, chicken, duck, or haddock? After the fatted calf has been killed, shall we ask the butcher for a joint, for a leg, for a rib, or for a knuckle?

These, and a thousand other queries clamour at Christmas-time. And amidst all the excitement, flurry, scurry, and bustle, a still small voice says, in the ghost of a whisper, "What about the wireless?"

This, my brother radio-listeners, is the voice of Conscience. And woe betide the man, woman, child, or oscillator, who ignores the call!

The Breakdown.

You can, of course, harden your heart against the whisper, and stifle the pin-pricks of Conscience—but if so, be sure that pin will find you out! The Hour of Retribution will catch you bending! Right in the middle of the party the accumulator will run down, or the loud speaker will loud-speak no more. Then the music will be changed to lamentation, and there will be a great silence in the rooms of your father's residence. Then a great storm will arise, and the people will gather themselves together. Around you, and you only, will the people gather—and, well, you'll know it!

And the young maidens will weep, and will not be comforted (despite the untiring efforts of the opposite sex). There shall be a gnashing of teeth, and a whale of a wail. All the joy and jazz will give place to lamentations, and the dancers will be desolate.

The old men will gather themselves together and say, "Who did this thing?" And the old women will be there—and will not be silent (you can bet).

Every Eye on You!

And the head of the house will rise up in his place. And all eyes shall be turned upon *him*. And his voice shall ring out like a clarion call, and he shall say, "George, my boy, whassamatter with the wireless?" And then every eye will be turned upon *you!*

The floor, it will not open and swallow you up. The ceiling, it will not come down and create a diversion. There shall be no escape. No evasion or equivocation.

In that hour every ear shall be open to hear your voice. All the young men and maidens will listen. The old men will listen also, and also the wives of the old men, they will listen, too.

And the young children will be there (confound them), and *they* will listen.

(*But what can you say?*)

In the forefront of them that are against you will be Your Young Brother. Right in the front will he take his stand. And when all the people listen, he will listen. He, too, will hear nothing. But he will miss nothing!

The Air Ministry's new wireless station at Mitcham, Surrey, which, as this photograph shows, is now nearing completion.

And, when the silence can no longer be endured, he will *grin*. Your Young Brother will grin like anything. At you!

Bert, his bosom pal, also will grin. Bert will snigger and grin. Your Young Brother and Bert his pal will snigger and grin together. And all the people will join together and do likewise.

But you, and you only, will not grin. You will sneak off to an upper chamber in that house, and shut the door behind you, and there you will kick yourself. Good and hard will you kick yourself, in the silence of that night.

And in the hour before the dawn you will see the error of your ways. And you will take a sheet of paper—a sheet of pure white paper, whiter than the driven snow—and on it you will write words of wisdom. And these are the words of wisdom that you will write:

MEMO. FOR HAPPY CHRISTMAS (WIRELESS).

1. Is the accumulator properly charged?
2. If doubtful, arrange for spare accumulator, or some emergency supply.
3. Check up H.T. battery voltages. Renew if necessary.
4. Don't forget to switch set off, in excitement of Christmas Eve.
5. Glance over aerial and earth connections.
6. See that loud-speaker plugs, flex, etc., are in good order.
7. "Turf out" old grid-bias battery and renew, if voltage down.
8. Get that new valve in, if funds allow.

(N.B.—"It's better to be sure than sorry.")

The Haunted "Ham"

The story of a series of sinister events in an empty house.

By HIGHAM BURLAC.

EVERYTHING in this story is true, and far from being supernatural is very natural indeed, especially the horror. I should have welcomed a genuine ghost, because you can understand a ghost; better still, you can see the blighter. It is the unseen and mysterious that makes your scalp tighten and your heart "knock."

It was late on Christmas evening. I and my small family—a "bob" and a brace of threepenny-bits—had been round at a "do" with the Parker lot, and had wound up very comfortably, the youngsters at nine and the oldsters at eleven-thirty. A dryish party; nothing but slight local "draughts" occasionally when Parker and I slipped out of the room on little errands of our own devising—to fetch another pair of 'phones or a new battery and so on—and met, strangely, by the pantry. Oh, really a most proper evening, with Ring o' Roses, Musical Chairs from 2 L O and a radio revue.

I Go Home Alone.

My wife, etc., etc., were to sleep under the Parker roof. Right bang under it, too, as I noticed when I put young George to bed. When my head hit the dormer I felt like a chick must when it takes the first bump at the eggshell. Parker gave me the choice of the sofa and the bath, but as we had had late summer holidays the memory of the bed at Quaystown still rankled—on my hip-bones—so I decided to go home. This, I said, would be mighty convenient, as I particularly wanted to sit up for Yokohama Radio.

"Then the mat began to slide, me with it . . ."

It was pitch-dark outside, and very quiet. As I walked I started to whistle, but it sounded—well, like whistling in church, so I shut off. I noticed that a black cat ran across my path, and that a dog was howling a sort of death-watch in the butcher's yard. Also I tripped over a grating and, in addition, stepped off the pavement before I was aware I had reached the kerbstone. I nearly snapped my tongue off and the incident joggled my nerves.

I reached my house. If you have not noticed how much darker, how sinister a house looks late at night when you *know* it is empty, just make an observation on the next convenient occasion. It looks as though it hides some gruesome secret within its black walls; a corpse, say, with a gibbering maniac beside it, seated on the ruins of the furniture.

". . . how sinister a house looks at night when you know it is empty . . ."

Overcoming some such childish fancy I pushed boldly at the front garden gate. It was immovable! Then I noticed a faint rush of perspiration, a mere clamminess. I felt for the handle, but the darned thing had disappeared! Beyond a joke—what? Feeling in need of relaxation I tottered away, leaned my forehead against a nice cold lamp-post, and tried to size it up.

Things Begin to Happen.

Well, of course, I found the handle on the right-hand side of the gate, whereas I had tried to open the left.

As soon as I set foot on the mat just inside the front-door, I began to perspire freely. Added to the smell of the Christmas pudding which had been boiled in the morning, one of the most clinging odours known to householders (though not in the same class as that of boiled cabbage), there appeared to me to be a new smell abroad which boded me ill. Then the mat began to slide, me with it, and we brought up against the hall-stand, which shook down two walking-sticks. These sounded through the echoing house like thunder, and I fancied I heard a scuffle upstairs. Now that smell was due to a new kind of floor-polish which caused the mat and I to glissade. So natural! M'yes!

I had left a new valve in the dining-room and I thought I would grab it and go straight upstairs to my wireless room; I should need my overcoat, anyway. I got the valve and began to march upstairs, singing a snatch of song, and I was halfway up the first flight when my hat was dashed from my head. I turned in a flash, my heart beating wildly and my blood apparently frozen, but the staircase was empty save for myself.

Leaving the hat to look after itself I galloped, panic-stricken, up to my room, entered it and shut and locked the door. In pulling my hand sharply away I somehow pulled out the key, which slipped off into the darkness. Almost simultaneously I dropped the valve; I could have sworn that it was snatched away from me.

"Good lor'!" I muttered, "*that's* a goner!" And I listened for the crash. *But there was no crash!* Either some unseen agency had taken the valve, or else the thing had vanished into a bottomless pit. I stepped widely over the spot and reached the other side of the "pit" in safety.

The Vanishing Valve.

It required some courage to switch on the light, for I had no particular desire to stretch out my hand and have it, perchance, clasped icily by the intruder (if any). However, I did it. And there was my valve lying on the spongy rubber mat used by our maid when scrubbing floors.

I walked over to the valve, thinking to recover it, but as I bent to pick it up *the light went out.* I sprang back like a dog when it meets a snake. Sensation was piled on sensation and my nerves had by this time become as sensitive as a super-het. Before I had time to lick my dry lips the light came on again. *But the valve had disappeared.*

I looked under the table, just like a maiden lady looks under the bed for the fatal burglar—and there were the valve and the key side by side. I suppose I had jumped on the rubber mat and given the valve a spring off.

I was very successful with Yokohama Radio, and heard an appropriate talk on "hari-kari," which completed my happiness as you may imagine.

Next morning I found that the barometer which hung on the wall of the staircase had somehow or other let fall its hinged glass cover, which had knocked off my hat.

"I was half-way up the first flight of stairs when my hat was dashed from my head."

"PROGRESSIVE" FOUR

This article describes the addition of the final stage. The set is now an efficient four-valver suitable for long-distance loud-speaker work.

By G. V. DOWDING, Grad.I.E.E.
(Technical Editor.)

THIS week we arrive at the fourth stage, and nearly, but not quite, complete our task. If all has gone well you should now be in possession of a three-valve outfit that is really giving three-valve results. If it should happen that you are not quite convinced that your set is 100 per cent efficient, please do not tackle this fourth stage until you are perfectly satisfied with the present condition of the receiver. Slight faults in respect of lack of sensitivity can be "blanketed" by additional amplification it is true, but minute imperfections in reproduction will be magnified enormously. Your ideal, and the one I trust you will achieve, must be optimum sensitivity together with faultless reproduction.

THE EXTRA COMPONENTS YOU WILL REQUIRE.

- 1 Low-frequency choke or an anode resistance of 250,000 ohms resistance (see text).
- 1 Grid leak and holder (2 megohms) (Mullard, Lissen, Dubilier, etc.).
- 1 Valve holder.
- 1 ·01 mfd. mica fixed condenser (Mullard, Clarke Bros., Lissen, Dubilier, etc.).
- Terminals, wire, etc. See article before buying new components.

The last stage is another low-frequency amplifier, and with this really powerful loud-speaker results should be obtainable from quite a number of stations. I have chosen the choke-coupled method for this ultimate amplifier, although constructors who prefer resistance-capacity coupling can have this. The only alteration is the replacement of the low-frequency choke for a 250,000-ohm wire-wound resistance.

The Choke Coupling.

Now refer to the theoretical diagram, and I will give you a brief description of how our choke coupling operates. Instead of the plate of the third valve being connected to the loud-speaker terminals as it was formerly, it is now joined to one side of a low-frequency choke. A low-frequency choke is, as its name suggests, something which tends to prevent the passage of low-frequency currents such as are present in the anode circuit of a low-frequency valve, and which operate loud speakers and telephone receivers.

So instead of flowing round the H.T. battery-L.T. circuit through the choke, the low-frequency impulses from the third valve are diverted through the ·01 mfd. fixed condenser on to the grid of the fourth valve. They are then handed over to the loud speaker in a considerably magnified form. Now, much of the purity of the reproduction will depend upon the careful selection of the values of the choke, ·01 fixed condenser, and grid leak. From a purely constructional point of view the addition of this last stage will present no difficulties whatever, more especially after your experience with all the preceding stages, but if your results are to be really good I must impress upon you the importance of adhering to the stipulated values of components, and the necessity of selecting them with care.

The fixed condenser must have a capacity of ·01 mfd.—no more and no less. And it must be of a really first-class make, preferably one that has mica plates, such as

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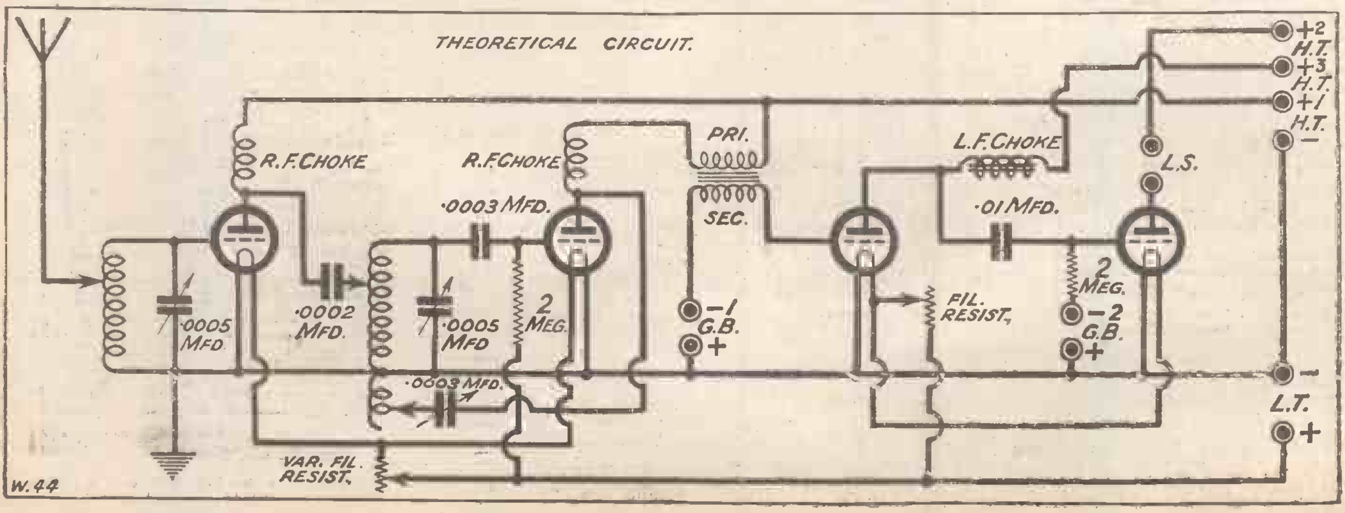


"PROGRESSIVE" FOUR.

(Continued from previous page.)

the large capacity Dubilier Mica Condenser. The grid leak, too, must be above reproach both in respect of correctness of value and in reliability. Do not purchase one of doubtful origin. A grid leak made by one of the first-class firms in the country is an inexpensive item.

A "Key" Component.

Finally, the low-frequency choke is a real "key" component, and if it is "dud," then the remaining part of the set could be superb without rendering the final results passable. The main requirements of an efficient low-frequency choke are that it should be able to handle a fair amount of steady current without reaching a point which is known as saturation, and that it should possess a pretty high inductance. If it can handle up to 5 or 6 milliamps of anode current (H.T. which flows in the anode circuit of the third valve), and has an inductance of at least 50 henries, then there cannot be much wrong with it.

Do not buy an unbranded low-frequency choke, and one that does not carry the guarantee of the name of a leading British manufacturer. There are plenty of good low-frequency chokes to choose from, including such stalwarts as the Marconiphone, R.I. and Varley, Pye, Ediswan, etc., etc. Somebody may tell you that an old low-frequency transformer can be used as a low-frequency choke in some way or another. And so it can—but not in the "Progressive!" Here you must

(Continued on next page.)

WIRING INSTRUCTIONS.

Remove lead number (9) from 'phone terminal and join it to one terminal of low-frequency choke.

Now proceed with the new leads.

Join 'phone terminal now disconnected to the plate terminal of the fourth (new) valve holder (36).

Join one filament terminal of new valve holder to one filament terminal of third valve holder (37).

Join other filament terminal of new valve holder to other filament terminal of the third valve holder (38).

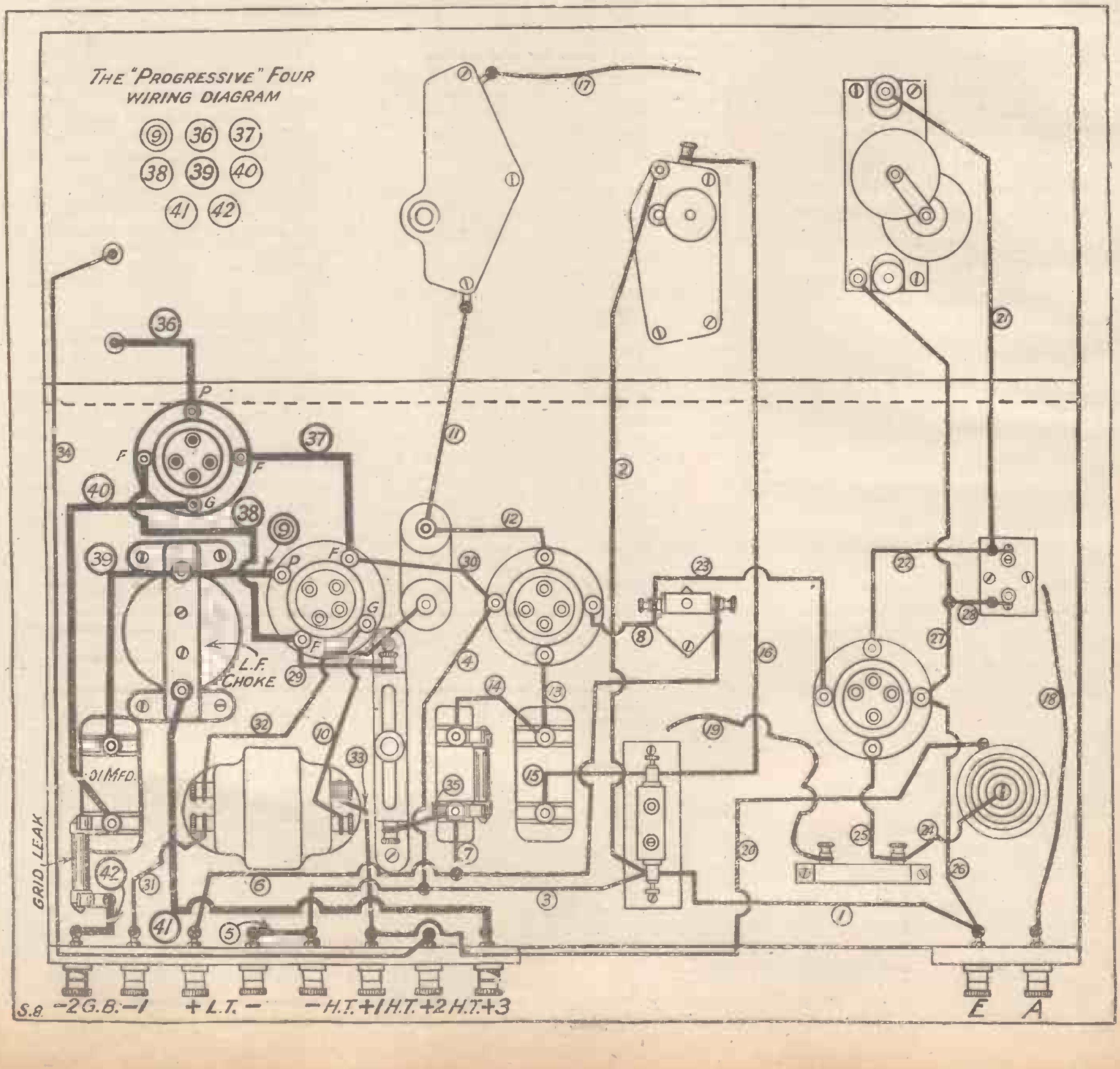
Join terminal of low-frequency choke, which is also connected by lead number 9, to one terminal of the ·01 mfd. fixed condenser (39).

Join grid terminal of new valve holder to remaining terminal of ·01 mfd. fixed condenser (40). (This terminal of the ·01 mfd. fixed condenser holds a grid leak clip.)

Join remaining terminal of low-frequency choke to the H.T.+3 terminal (41).

Join grid leak to G.B.−2 terminal (42).

There are 7 new leads.



"PROGRESSIVE" FOUR.

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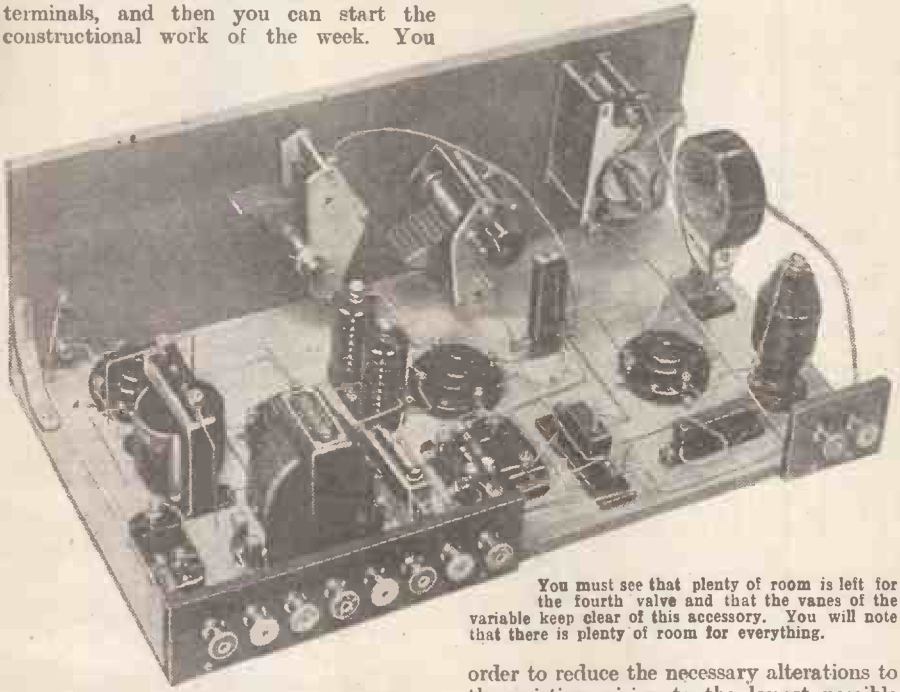
place yourself above compromises and wangles and see that the best you can afford of everything is used.

Well, the only remaining items required are another valve holder and two more terminals, and then you can start the constructional work of the week. You will find that there is only just about enough room for the new components, although it will not be necessary to do any "crowding." The valve holder is placed well back on the baseboard, and you must see that even when a large valve is used that this will clear the vanes of the variable condenser.



You must see that plenty of room is left for the fourth valve and that the vanes of the variable keep clear of this accessory. You will note that there is plenty of room for everything.

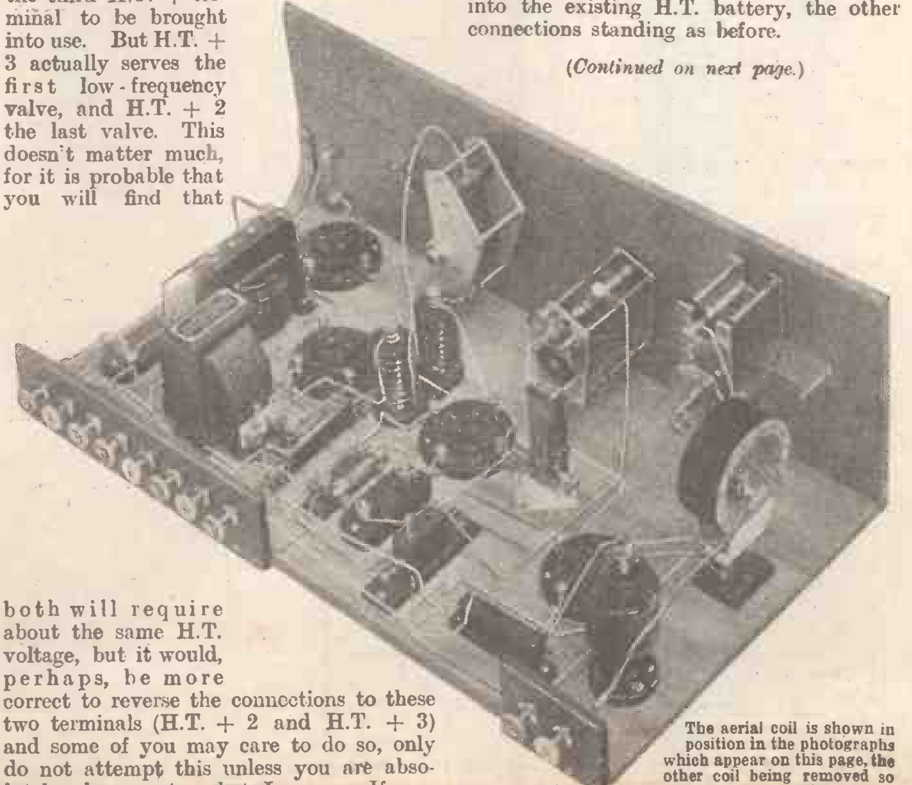
I have had a special photograph taken to show clearly the disposition of these new parts, and from this you will easily be able to obtain guidance for the disposal of your own individual new components.

One Lead Alteration.

You have only to alter one of the old leads and I think that it may be better if you disconnect it right away. Lead No. 9 is the one in question. This should be disconnected from the lower loud-speaker ('phone) terminal. Its other end need not be disconnected, and the lead can be left sticking straight up in the air until it can be reconnected to the new point—a terminal of the low-frequency choke. Of course, the lead can be removed entirely if you prefer this and an entirely new one snipped off and connected up in due course. No. 9 lead still retains its old number, but in the diagram it is enclosed within a double ring instead of in a single ring in order to remind you that something happens to it.

Have you noticed the manner in which I have disposed of the grid leak? It is held in two of Messrs. Dubilier's grid leak clips, and one of these is fastened under one of the terminal screws of the ·01 mfd. fixed condenser. The other clip is fixed by means of a small nut and screw to an ordinary soldering tag of small size, and this is soldered to a small piece of wire, which in its turn is fastened to the new grid-bias terminal. If you are going to adopt the same scheme I should advise you to get it all fixed before you finally screw the condenser down on to the baseboard.

Now, I do not think I need say much more about mounting the components or even the wiring, but there is just one little point I must bring to your notice. In order to reduce the necessary alterations to the existing wiring to the lowest possible number, I have shown the low-frequency choke connected to the new H.T. + terminal. This is marked "3," for it is the third H.T. + terminal to be brought into use. But H.T. + 3 actually serves the first low-frequency valve, and H.T. + 2 the last valve. This doesn't matter much, for it is probable that you will find that both will require about the same H.T. voltage, but it would, perhaps, be more correct to reverse the connections to these two terminals (H.T. + 2 and H.T. + 3) and some of you may care to do so, only do not attempt this unless you are absolutely clear as to what I mean. If you cannot quite dig out the sense of this last paragraph by ignoring it you will not be missing anything vital.



The aerial coil is shown in position in the photographs which appear on this page, the other coil being removed so that you can see the wiring.

As before, I am showing all the new components and wiring in thicker lines on the wiring diagram than all the existing gear and its wires. This, together with the numbers and the wiring instructions, should prevent you from going wrong. But do not forget to cross out those numbers in the top left-hand corner of the diagram as you connect up the appropriate leads.

There are still one or two little things I am going to ask you to do before I write "finis" to this series, and these I am going to leave over until next week. Therefore, if you notice the omission, so far, of a few of what you yourself consider rather vital pieces of gear, please have a little patience. Everything of real importance to the operation of the four valves is now arranged for, and before we come to embellishments I want you to get the set to work to your own full satisfaction.

The New Battery Adjustments.

In this last valve holder an L.F. valve of the power type is essential, and even a super-power valve could usefully be used. As much as 15 volts grid bias may be needed, although it is possible that good results will obtain with much less than that. The grid bias needed depends upon the valve and H.T. used, and I must refer you to the remarks I made last week on the subject. Of course, the same grid-bias battery can be employed for both of the low-frequency valves. The only addition required is another flexible lead and wander plug, which should be connected to the G.B.—2 terminal. The other grid-bias connections remain exactly the same as before. This also applies to the H.T. In this case, too, another flexible lead and wander plug are connected to the new H.T. + terminal, and the plug plugged into the existing H.T. battery, the other connections standing as before.

(Continued on next page.)

"PROGRESSIVE" FOUR.

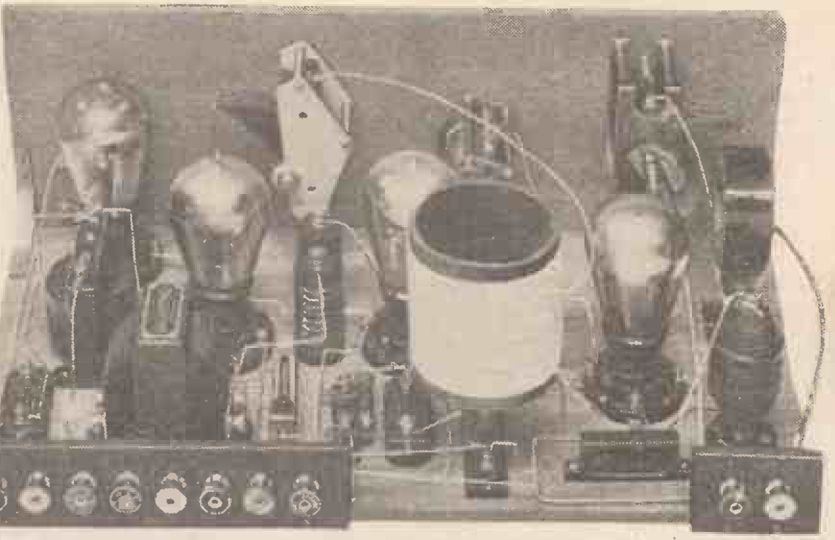
(Continued from previous page.)

Let me just refresh your memories in respect of H.T.'s, valves and etc., at the same time as I run over the requirements of this last stage of low-frequency amplification. In the present high-frequency position a high-frequency valve of the medium impedance type should be used, such as the P.M.1, D.E.3H.F., etc. As a detector a general-purpose valve of the "H.F. Det." type will be found to give good results, and of these among 2-volters are the D.E.2., Cossor Point One, and so on. A power valve should be used in the first low-frequency position. Among 2-volt power valves we have the P.V.2, D.E.P.215, Stentor 2, and so on. There are several 4-volt power valves, and quite a number in the 6-volt class.

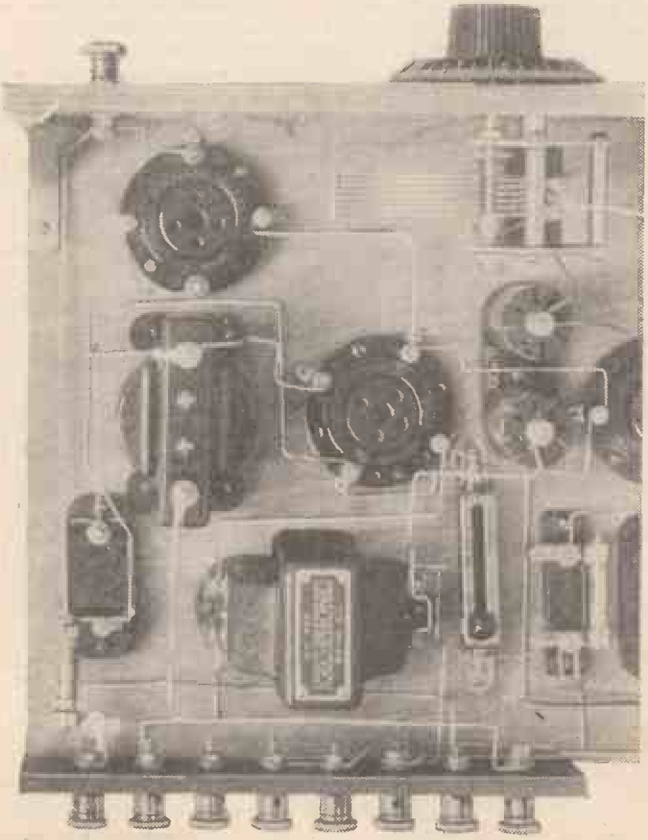
The Last Stage.

A super-power valve can be used with advantage in the last stage, although here an ordinary power valve will function very well, unless the volume is particularly great and a pretty large speaker in use.

The H.T. + 1 terminal should be taken to a tapping on the H.T. battery somewhere around 60 volts, while anything between 99 and 120 will be needed for H.T.'s + 1 and 2. These and the grid-bias voltages you must adjust yourself until you are satisfied that the sensitivity and tone of the set are all that can be desired.



Here is the completed set with valves and coils in position. The terminals, reading from left to right, are: G.B.−2, G.B.−1, L.T. +, L.T.−, H.T.−, H.T.+1, H.T.+2, H.T.+3, and on the small strip E and A.



This photograph clearly shows the L.F. stages of the receiver, including the choke-capacity coupled one, the addition of which forms the subject of the accompanying article.

WHY VALVES BECOME PARALYSED.

PROBABLY the majority of dull-emitter valves at the present time still employ the so-called thoriated tungsten filament. There are, of course, an increasing number of valves now on the market with special filaments of other materials than tungsten. But as the thoriated tungsten and the oxide-coated filaments were the original dull-emitters, these still hold the field.

The electronic emission from the thoriated tungsten filament depends upon the presence of a very thin layer of thorium molecules or atoms on the surface of the filament. It should be noted that, unlike the oxide-coated filament used in many valves, the thoriated tungsten filament is not merely coated, but is permeated throughout its entire mass with thoria or thorium oxide.

During the normal operation of such a filament the thorium on the surface, which has a very high electronic emissive power, is continually "evaporated." If there were no more thorium to take its place, the thin thorium coating on the surface would soon be lost, and the electronic emissivity of the filament would gradually fall to that of an ordinary unthoriated tungsten filament. The effect of the proper temperature, however, is to "boil" fresh thorium out of the mass, converting the thoria into thorium and continually replenishing the very necessary and delicate thorium coating on the surface.

Every experimenter knows that it is very important not to raise the temperature of a thoriated tungsten filament very much above the rated temperature. If this is done the thorium is driven completely away from the surface, and the emission falls. By a kind of "juggling" with the filament temperatures afterwards it is possible to "boil out" more of the thoria, converting this into thorium, and so to put back the filament into more or less its original condition. So much for the use of too *high* a temperature.

Insufficient L.T.

What is not so commonly known, however, is that the operation of the thoriated filament at too *low* a temperature is also very bad for the filament. In this case the "boiling out" of the thorium becomes abnormally retarded, and there is insufficient thorium produced at the surface for the proper electronic operation of the valve.

Hence it is very important that a thoriated tungsten filament valve should be operated strictly at its rated filament voltage. This may be done, either by means of individual rheostats (using an accurate voltmeter occasionally), or perhaps more simply by means of the so-called self-adjusting or automatic rheostats.

DISCOVERY DATES.

Marconi invented the aerial in 1896, and was granted a patent for it in 1897.

* * *

Dr. Fleming, of London, invented the valve detector in 1904, and it was not until four years later that the grid was introduced by Dr. Lee de Forest.

* * *

Reaction was discovered about the year 1913.

The House on the Cliffs

A short, breezy little sketch that has been specially written for broadcasting. The author has produced several revues for the B.B.C. and is well known as a producer on the legitimate stage.

By **OSCAR M. SHERIDAN.**

THE SCENE, *as the title suggests, takes place at a lonely house on the cliffs, ten miles from anywhere.*

(In the oak-panelled room, JAMES FRENSHAM, *grey-haired and very worried-looking, is busily writing. There are two other characters. One of them is Mr. Murgatroyd, in charge of the police-station at the village of Fairbanks, whose inhabitants are so narrow-minded that they think the famous film star took his name and makes all his films in their honour.* MR. MURGATROYD *is of the opinion that one day he will be one of the Big Four. Unfortunately no one shares that opinion with him. The other is* MARTHA, *the housekeeper. There is also* ROBBINS, *a policeman.)*

“ You called, sir ? ”

(The scene opens with JAMES FRENSHAM *muttering angrily to himself, and throwing his pen on the table with a gesture of dismay.)*

FRENSHAM: Terrible! Terrible! *(His heavy sigh can be heard, and he starts to pace the room.)* To think that twenty-four hours ago I was the happiest man alive. Now I'm not even alive! Confound women, they wreck a man's happiness with as much thought as—as——. Good lord, why, even words fail me! I must be going mad! Yes, that's what's wrong with me. It's this continual loneliness, the never ceasing howling of the wind, the monotonous beating of the raindrops on the windows that is driving me mad, and then—oh, but it's impossible! I can't have gone as far as all that to have—— Hello! Who can that be?

(He stops in his stride as he hears the moaning of the wind and, in the distance, the slam of a door.)

Who's there? There's nobody, of course. My nerves are all on edge. What a fool I was to ever come here. I might even be murdered and nobody would be any the wiser, that is, of course, excepting Martha. Martha, ha! she might even do it herself. I've always been suspicious of her. She doesn't drink, which is always a bad sign in a cook.

(Again the moaning of the wind. Again the slam of a door.)

I had better see who is there? *(He goes to door and opens it.)* Who is that? Martha! Martha! Are you there? Heavens, what a holiday! Living in a gale-swept house with a deaf cook, and a rotten one at that. Bah, I'm getting foolish in my old age! I must be sensible and be ready to face the consequences. At any moment now my search may be ended, and I shall capture the elusive thing they call—what's its name? Why, I've even forgotten that. M'm! I think a drink will do me good. I'll ring the bell. With a bit of luck she'll hear me. *(He rings a loud bell.)*

(There is a knock at the door. Enter MARTHA.*)*

MARTHA: You called, sir?

FRENSHAM: No, Martha, I rang.

MARTHA: What's that? You heard a bang? It must have been the door of the garridge.

FRENSHAM: I didn't say I heard a bang, Martha, although I did.

MARTHA: Then why didn't you?

FRENSHAM: I said I rang, I didn't call!

MARTHA: I wasn't in the hall.

FRENSHAM: I never said you were. *(He shouts at her, going close to her.)* Whisky, Martha!

MARTHA: Not on your life.

FRENSHAM: Why not?

MARTHA: I'm not going to let you kiss me. So there, Mr. Frensham!

(Exit and bangs door.)

FRENSHAM: A lunatic asylum—I knew it! *(He opens door.)*—Martha, come back!

MARTHA: Well, what is it this time?

FRENSHAM: I want a drink. *(Puts finger in cheek and produces popping noise.)*

MARTHA: Well, why didn't you say so first time?

(Effects of getting drink.)

FRENSHAM: Ah, that's better.

MARTHA: I posted it, sir.

FRENSHAM *(with sarcasm)*: Good-morning!

MARTHA: Not yet, sir, you see 'e's got galloping presumption, but he ain't dead yet.

FRENSHAM: While there's life there's hope.

MARTHA: That's an idea, sir, we've tried everything but soap.

FRENSHAM *(gently)*: You know, Martha, you really must go to bed. It's very late.

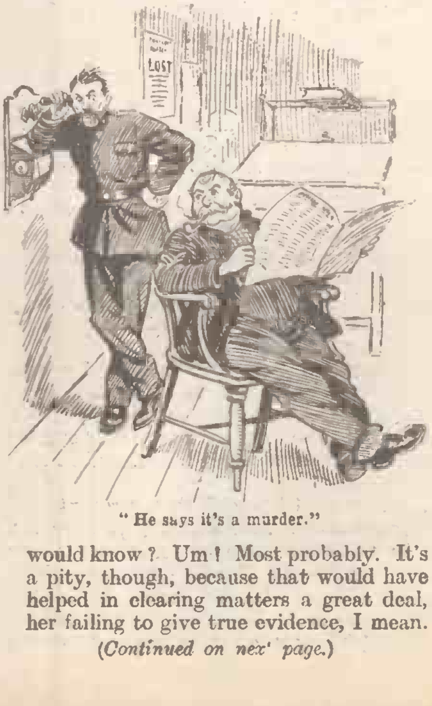
MARTHA *(laughs coyly)*: Fancy you calling me Kate. You know it's Martha. Well, I suppose you people must have your joke. Good-night, sir!

FRENSHAM *(shouts with all his force for fear of being misunderstood)*: GOOD-NIGHT!

MARTHA: All right, I'm not deaf.

(Bangs door as she exits.)

FRENSHAM: Well, that's over! Now I'll be able to think things over quietly. First there was the murder. Then the inquest at which Mona gave false evidence. Why did Mona do that, I wonder? Is it because she was afraid that her lover would know? Um! Most probably. It's a pity, though, because that would have helped in clearing matters a great deal, her failing to give true evidence, I mean.



“ He says it's a murder.”

(Continued on next page.)

THE HOUSE ON THE CLIFFS.

(Continued from previous page.)

And then on top of the awful tragedy comes the death of Mona. It is two hours since she was found by Martha. I wonder. After all, it would take *them* two hours to get here. They've only got a pony and trap, or perhaps a horse, at Fairbanks, and that fool of a Murgatroyd would never suspect. If he did I could be away from here in say ten minutes at the utmost, after doing the rest and getting rid of the body. If the body were found that would spoil everything. Mona is full of vanity. The mere fact of her disappearance would keep her in the public eye for a bit, and that might console her over her untimely end. I'm sorry, Mona, but it had to be done. How coldly one can review the sordid details of a murder after it's been done! Ugh! it makes me shiver, even I to whom murders are a common occurrence. This makes the seventeenth, and slowly but surely the net is drawing tighter and tighter. If I carry on in this way much longer, there will be no escaping. Well, here goes. (*He picks up the telephone.*) Hallo, is that the Exchange? My name is Jasper Bevan and I want Fairbanks 10. How long will I have to wait? It's direct, isn't it? Oh, hello, is that Fairbanks Police Station? I want to speak to Sergeant Murgatroyd. My name's Bevan.

(Robins, *the* Policeman *at Fairbanks police station answers the 'phone.*)

Robins : Who is that? Well, Mr. Bevan, h'is h'it very important, because I'm afraid that Mr. Murgatroyd is extremely busy reviewing the facts of some missing jools.

(Mr. Murgatroyd *is busy reading a paper, but nods approvingly at his assistant.*)

Murgatroyd : That's the stuff. It's aducive to the nonentity of crime, that's my motter.

Frensham : You may tell him it's not very important. It's only a murder.

Robins : A what?

Frensham : Murder. MURDER. M.U.R.-D.E.R.! You surely know what they are. They have them in every country where the police system is perfect.

Robins (*turning to* Mr. M.) **:** He says it's murder, sir!

Murgatroyd : No! at last, my chance has come! Give me that 'phone. Fetch that gun out of the drawer and give me those cuffs—no, the silver ones, you fool. This is a special occasion. Hello, this is Sergeant Murgatroyd speaking.

Frensham : Oh, yes.

Murgatroyd (*interrupting*)**:** Sergeant Joseph Murgatroyd, to be correct.

Frensham : Of course.

Murgatroyd (*interrupting again*)**:** Sergeant Murgatroyd in charge of Fairbanks Police Station.

Frensham : I know all that, sergeant.

Murgatroyd : And anything you say will be taken down in evidence—no, that's wrong. Wot's this 'ere mudrer? Wot h'is the name of the injured, and wot is your name? Let's be systematic about it. Give your or 'is or 'ers first, according to alphabetical order. Wot's the first name?

Frensham : Bevan.

Murgatroyd : Is that the murdered man's or the present speaker's?

Frensham : I'm Mr. Bevan.

Murgatroyd : Ah yes, of course. Now perhaps you'd give me a few details about the murder. Was the person alive when it was committed?

Frensham : Yes.

Murgatroyd : Was it a 'e or a 'er, and wot was the name?

Frensham : It was a 'er, I mean a she, and her name was Mona Lawrence. She was beautiful, and when found was attired from head to foot in scarlet with a dagger in her heart.

Murgatroyd : 'Orrible!

Frensham : I beg your pardon?

Murgatroyd : I was commenting.

Frensham : Oh yes, of course. Now will you please listen without interrupting?

Murgatroyd : Certainly, in anything I does not clearly understand I shall submit you to cross-examination.

Frensham : I agree. The body was lying prone on the floor of the oak-panelled study of the House on the Cliffs.

Murgatroyd : Not the 'aunted 'ouse!

Frensham : The very one, sergeant.

Murgatroyd : Um, that makes the case clearer.

"Was it an 'e or an 'er, and wot was the name?"

Frensham : I'm glad you think so. To proceed. The body was in front of the fire and in the grate were signs that she had been burning her letters. She had not committed suicide. It is obvious by the dagger in her heart, which is an ornamental dagger, by the way, with an Italian coat of arms on the hilt, that she was murdered. Possibly the crime took place because of political reasons. It is well known that Mona Lawrence, by her beauty and cold-heartedness had been the cause of many a vendetta in the streets of Florence where she was born.

Murgatroyd : Excuse me, sir, I'm taking all this down. I 'ope you will sign it, because this bringing Italy into it makes it rather fantarstic, I think you calls it.

Frensham (*testily*) **:** Of course. To proceed, there is no possible entrance down the chimney, the windows were barred and shuttered, there are no secret panels, no holes in the ceiling, and the floor boards do not come up. All the doors are locked, being locked from the inside. The important question, then, is how did the murderer get in?

Murgatroyd : I'm afraid I can't tell you.

Frensham : What? Do you mean you don't know?

Murgatroyd : Well, it might have been a skeleton key.

Frensham : No, it isn't.

Murgatroyd (*suspiciously*)**:** How do you know?

Frensham : Why, I wrote it!

Murgatroyd : Wrote what?

Frensham : Why, my latest novel—"The Murder of the Purple Lady," and I can't finish it. You see, I've got her murdered and everything, and now I don't know how it was done? Can't you help me, sergeant?

ITEMS OF INTEREST

In an overcharged accumulator the positive plates instead of being brown are much too dark—at times almost black.

* * *

Telephones or similar sensitive apparatus should not be stood near a newly-charged accumulator, as the gassing from the latter is liable to cause considerable damage.

* * *

Very sharp tuning on the high-frequency side of the set is not altogether advantageous, as it has the effect of cutting off the side bands, i.e. suppressing or greatly reducing some of the audible frequencies, which are necessary to give the full tone of musical reproduction.

* * *

Where ringing noises are troublesome it is a good plan to rest the set upon rubber sponges or some similar resilient shock absorber.

* * *

One of the commonest causes of backlash and unsatisfactory reaction control is the use of an incorrect H.T. voltage.

* * *

The B.B.C. is experimenting with spaced aerials in an effort to solve the problems of fading.

* * *

A hole which has been made in the wrong place on a panel can be filled in with Chatterton's Compound or "Glitterwax." The latter is a toy modelling substance, obtainable in penny sticks at almost any toy shop.

* * *

Instead of an L.F. transformer an anode resistance should be used for coupling, in the plate circuit of an anode-bend detector.

* * *

The level of the acid in an accumulator should never fall below the top of the plates.

* * *

Before attempting to drill a hole in ebonite its position should be centre-punched, or otherwise the drill will tend to wander from the proper position.

The A B C of H.F. Amplification

Continuing our Series for the Beginner, this article deals with NEUTRALISING (Part 1).

By G. P. KENDALL, B.Sc.

In the last article in this series I explained just why it is that the simple form of H.F. amplifying circuit tends to oscillate, and showed how this difficulty grew more acute as valves became more efficient, circuits more selective, and so on. We also saw how this tendency to oscillate can be controlled in various simple ways, commonly called "losser" methods, which, although having the desired effect of damping out self-oscillation, are not very efficient from the point of view of obtaining the maximum amplification and selectivity from a given circuit. Altogether, losser methods have now largely been abandoned for long-distance receivers, and are only occasionally used for controlling the volume on a strong local station, for which purpose they have certain special advantages with which we are not concerned here.

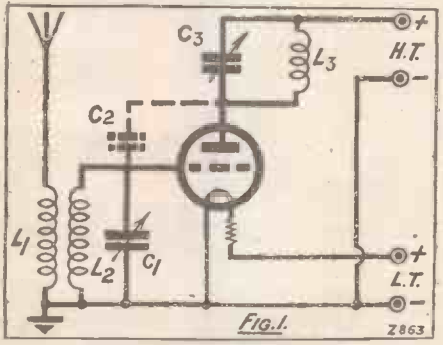


FIG. 1.

It now remains to discuss the more modern method of stabilising which is usually called neutralising (sometimes neutrodyning), and this is, unfortunately, far too large a subject to deal with at all thoroughly in a simple article. Actually, it could not be done properly if I were allotted the whole of this issue of "P.W.", and hence we must content ourselves with a very brief survey indeed of some of the more important forms of the neutralised circuit.

Valve Capacity.

Let us look first at Fig. 1, where we see a high-frequency amplifying valve with a tuned-anode circuit, and one of the more modern selective aerial-coupling arrangements. Here L_1 is the semi-tuned aerial coil, with the fully-tuned secondary circuit composed of the coil L_2 and the variable condenser C_1. The plate to grid capacity of the valve, which is one of the main factors causing it to oscillate, is represented by the dotted condenser C_2, while L_3 and C_3 compose the tuned anode. This circuit will, in all probability, oscillate violently when the anode and grid circuits are tuned to a suitable wave-length, for the reason that the plate-to-grid capacity of the valve feeds back sufficient energy to maintain a state of continuous oscillation.

Simple Principles.

Now the elementary principle of the neutrodyne circuit is quite easy to comprehend, provided we are content with a general understanding of the main idea. What we must do is to find some means of feeding back energy from the plate to the grid circuit which shall be opposite in direction, so to speak, to that which is fed back by the plate-to-grid capacity. What we want is sometimes called "a negative reaction effect," and it could be done after a fashion by coupling the coil L_3 to the grid coil L_2 in the opposite direction to that which would be required to produce positive reaction. This method of obtaining negative reaction could be used to stabilise valves, and indeed has been used, but it is not very satisfactory in practice, because a suitable adjustment will not "stay put" over any appreciable tuning range, and requires manipulation constantly during tuning.

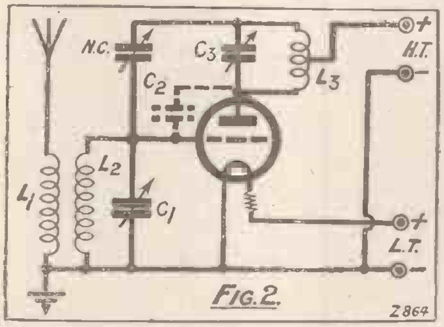


FIG. 2.

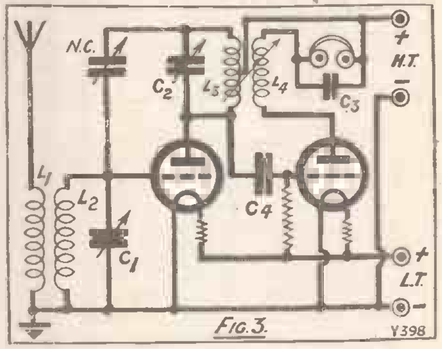
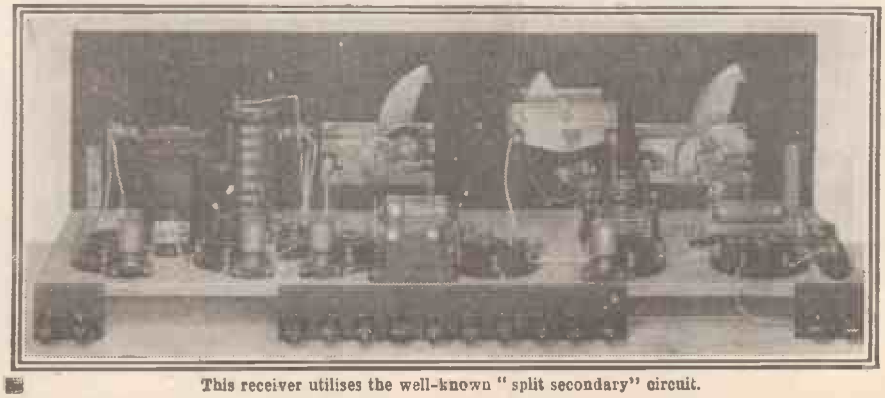


FIG. 3.

What we want is some arrangement which will feed energy back to the grid from the plate circuit, and which shall be opposite in its effect to that which is fed by the plate-to-grid capacity, and which shall at all times be exactly equal to that which is fed back through the valve. Evidently what we want is to find some point in the anode circuit which is, at any given moment, at opposite potential to the anode, and connect between this point and the grid a small condenser which can be adjusted until we find that we are feeding back just the right amount of energy.

(*Continued on next page.*)


This receiver utilises the well-known "split secondary" circuit.

THE A B C OF H.F. AMPLIFICATION.

(Continued from previous page.)

If we remember that in any free tuned circuit the two ends are at opposite potentials at a given moment when oscillations are flowing therein, we shall soon see where to look for the correct point on the anode circuit. Obviously, if one end is connected to the anode, the other will be the point from which to take our negative feed-back, provided that we arrange for this opposite end to be free to assume an opposite potential at any given moment. What is meant here is that this end shall not be connected to the H.T. battery, since this is very much the same as earth, which, of course, would be always at zero potential. This point is, perhaps, rather difficult to follow, but if you think it over you will see that if we connect the centre of the coil to H.T positive we shall achieve the desired effect, leaving the farther end free to assume an opposite potential to that of the anode end at any instant.

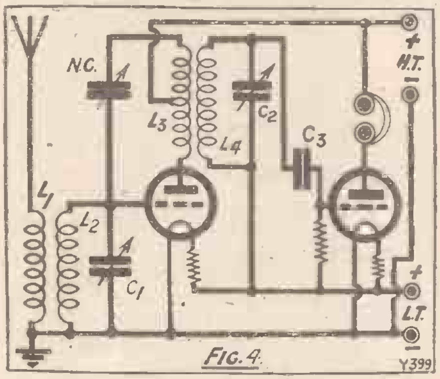


FIG. 4.

Thus, when the anode end is positive, the opposite end is negative, speaking in terms of H.F. potential, so that we can get our desired feed-back on to the grid circuit by means of a small variable condenser, commonly called a neutrodyne condenser, connected between the two desired points. If we make the capacity of the neutrodyne condenser somewhere about equal to the plate-to-grid capacity of the valve, we shall find that with a little adjustment we can so arrange matters that the feed-back inside the valve will be perfectly neutralised, and the circuit will become quite stable.

This ideal state of affairs is not very easy to realise in practice, since there are certain little difficulties concerned with the use of this circuit (commonly called the split-tuned anode), and these are not very easy to overcome in practice. Consequently, it has never achieved any wide popularity, various other forms having been found rather easier to apply in practice.

Before passing on to the next type of circuit, the reader may be interested to glance at Fig. 3, which shows a practical form of the neutralised split-anode circuit, with reaction upon the anode circuit of the detector valve, this combination being one capable of giving quite good results as far as sensitivity is concerned. Its main drawback is that, unless special precautions are taken, the neutralising adjustment does not hold very constant over the tuning range.

A very much more popular neutralising arrangement is that which is commonly called the split primary, in which a tuned H.F. transformer is used as a coupling between the valves, a comparative small primary winding being used with a large secondary which is tuned with a variable condenser. The method of neutralising will be understood quite easily if you compare Fig. 4, which is a simple form of split-primary circuit, with Fig. 2, for you will see that the anode circuit of the valve in Fig. 4 contains a coil which is provided with a centre tap very much as in Fig. 2, one end of the coil going to the anode and the other round to the neutralising condenser, while the centre tap is connected to H.T. positive.

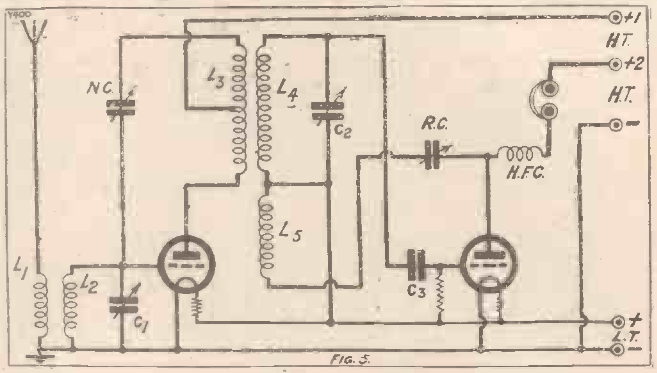


FIG. 5.

A Popular Device.

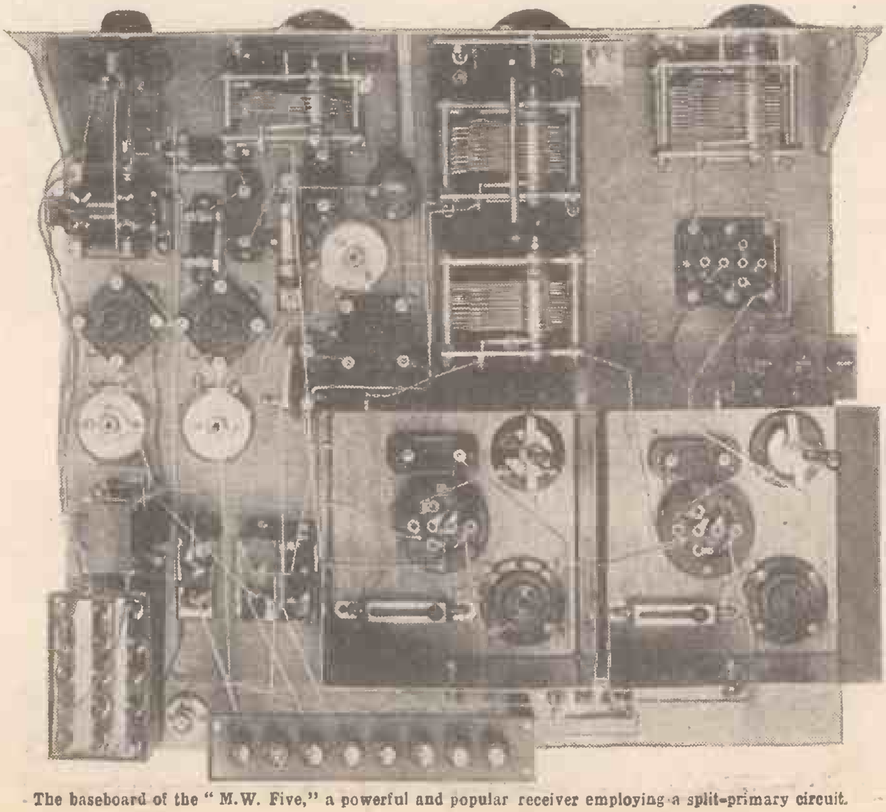
As a rule, this winding is referred to as the primary and neutralising winding, the two portions being regarded as separate windings. The functioning of this circuit, however, can be regarded as being very similar to that of the split-tuned anode, since the effect of the currents flowing in the primary portion of the winding is to generate currents in the neutralising winding which can be used to produce a feed-back on the grid of the valve which will be opposite in its effect to that which takes place through the plate to grid capacity of the valve itself.

Thus adjustment of the neutralising condenser can again be made to secure stability, and with a carefully-designed transformer a very useful degree of constancy can be obtained in the adjustment of the neutralising condenser, and in practice one setting can be made to serve for the whole of the tuning range of the set. It may not be quite perfect over the whole range, but for general purposes quite good effects can be obtained.

A Practical Circuit.

In Fig. 5 you will find a practical form of a split-primary circuit, with the usual aerial-coupling scheme, consisting of the semi-tuned coil L_1, a tuned secondary circuit L_2, and a variable condenser, and then the transformer unit with the primary and neutralising windings L_3, tuned secondary winding L_4, and also a reaction winding L_5.

This latter, it will be noticed, is of the Reinartz type, which is usual in circuits of this nature, the actual reaction effects being adjusted by means of the variable condenser R.C. An H.F. choke is, of course, customary in the anode circuit of the detector valve, and this also is shown in Fig. 5. This is a very widely used circuit, and it may be remembered it was used for the series of "Cube Screen" receivers which have been described during the last few months in POPULAR WIRELESS.



The baseboard of the "M.W. Five," a powerful and popular receiver employing a split-primary circuit.

WHAT HAPPENED TO THE LISSEN BATTERY DURING 18 DAYS & 18 NIGHTS UNDER CONTINUOUS DISCHARGE

A LISSEN new process Battery was taken from stock on 23rd January, 1927. It was standard in every way with the LISSEN Battery you can buy at any Radio dealers.

It was put on test a day later and was discharged through a resistance of 150 ohms per cell, giving a discharge rate of 10 milliamperes.

The Battery discharged continuously under these conditions for 18 days and 18 nights, and at the end of that time the LISSEN Battery actually read 36 volts.

This is one of the most drastic tests any Battery could be put to, because it never had a chance to recuperate, which ordinary use provides.

The effective life of a LISSEN Battery, under normal conditions, would obviously be multiplied many times, and it is no uncommon thing for users to report that the LISSEN Battery has lasted over 12 months.

The higher the voltage of your Battery and the lower its internal resistance, the further you are away from Valve distortion—buy, therefore, a LISSEN Battery.

No Battery so stubbornly resists volt drop and has so low an internal resistance as the result of use.

This is due to the new process and chemical combination—employed only by LISSEN because only LISSEN knows the secret.

You can buy a LISSEN Battery identical with the above in every way—at 10,000 Radio Dealers throughout the country.

60 v. (actually 66 v.) - price 7/11
100 v. (actually 108 v.) - price 12/11
9 v. - - - - - - price 1/6

A sign of good taste

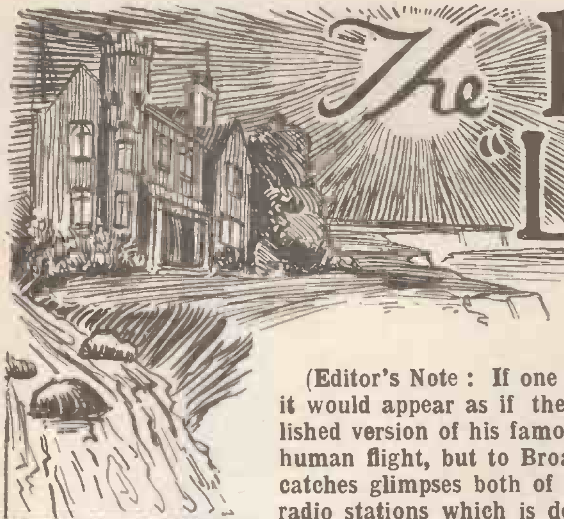
PLAYER'S

NAVY CUT CIGARETTES

PLAYER'S *WHITE LABEL* NAVY CUT TOBACCO 11D. PER OZ.

N.C.C.264.

Issued by The Imperial Tobacco Company (of Great Britain and Ireland), Limited.



The Radio "Locksley Hall"

(Editor's Note: If one may judge by this recently discovered fragment, it would appear as if the prophetic faculty Tennyson shows in the published version of his famous poem "Locksley Hall" extended not only to human flight, but to Broadcasting. With his amazing prevision he even catches glimpses both of the humour and the beneficence of a system of radio stations which is destined to make the British Empire, not a far-sundered congress of dominions, but just one big, happy, and united family.)

All who dip into the future see a time quite close at hand,
When the world shall sit and listen to the same percussive band;

When the latest fox-trot trembles to the far Antipodes,
And the Charleston, and Black Bottom ride the gales of all the seas.

You shall hear the Weather Forecast, when your own is very vile,
Of those heaven-reflecting places where the skies for ever smile;

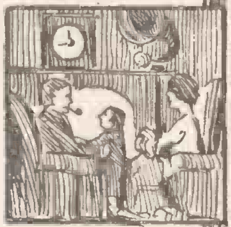
And, when you are sitting gasping in the grip of heat and drought,
You shall catch upon the ether news of frost and waterspout;

Thus may Cape Town, cool by proxy, bask upon the Polar ice,
And our foggy London borrow Fiji's solar paradise!

Sitting on the beach at Brisbane you shall hear the pleasant chime
Of Big Ben, 'mid London's traffic, giving Earth her Greenwich Time;

Pioneers of range and prairie, wanderers of the scrub and bush,
May be linked to English woodlands by the nightingale and thrush;

Atmospherics quite abolished, Perth shall chat with Ottawa,
Much as village politicians, simply-wise, lay down the law:

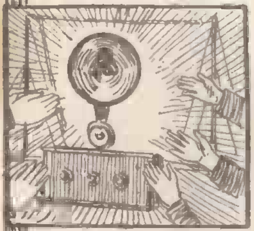


Saying: "Canada is calling for more men to till her land."
Saying: "West Australia's people would not make a crowded Strand."

Saying: "Million miles of Empire waiting for the sower's seed,
Waiting to produce the foodstuffs Britain's crowded cities need."

Why should men stand idly waiting in a hopeless, workless queue,
When there are ten million acres battening the kangaroo?

When the Empire is united by a viewless radio ring,
When we hear each other's laughter, hear each other talk and sing,



We shall be one happy fam'ly, sitting round the Christmas fire,
Hearkening to Christmas Carols, sung by Santa Claus's Choir.

We shall know each other better, shall not feel so far away,
Friends and neighbours, happy-hearted, swopping gifts on Christmas Day;

Thus may Wireless be an Angel heralding goodwill and peace,
And the war-drum's throb shall silence, and the shout of battle cease;

Why should not the British Empire, blended to one perfect whole,
Bring the prophesied Millennium from circumference to pole?

For, when men are truly brothers, language will not matter much,
Since I hold that Love's coherent, though it talk in Double Dutch!

A. B. COOPER.

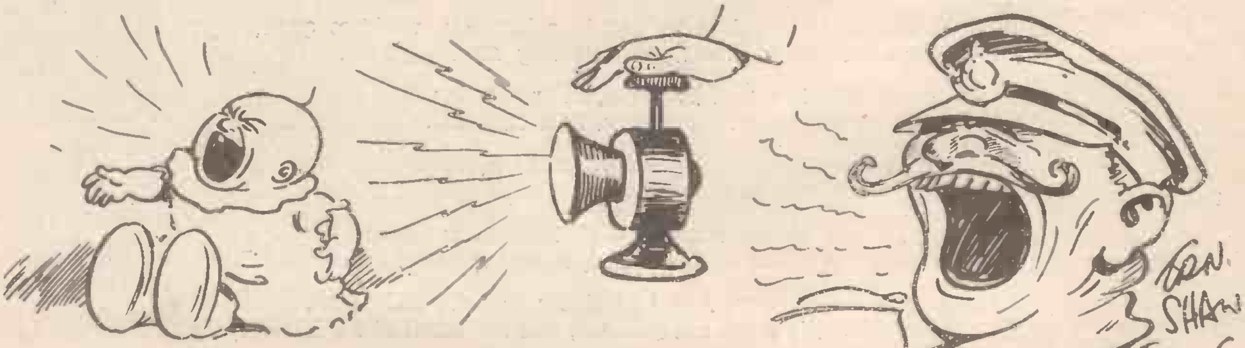
WHAT IS "LOUD SPEAKER-STRENGTH"?

-DOES IT COUNT IF YOU HAVE TO STOP THE CLOCK-HOLD YOUR BREATH AND PUT YOUR HEAD INSIDE THE SPEAKER?

AND WHAT ABOUT INVOKING THE ASSISTANCE OF A STETHOSCOPE? THEN ONE HEARS OF AMAZING PERFORMANCES OF

—"BABY" MODELS - PERHAPS THE TERM "LOUD SPEAKER-STRENGTH" APPLIES— ALTHOUGH IT MIGHT BE NECESSARY TO USE "TWINS" IN THE WAY SHOWN.

THEN AGAIN-SOME ENTHUSIASTS' IDEA OF LOUD SPEAKER STRENGTH IS WHEN THE 'SIGNALS' EMITTED SHAKE THE HOUSE TO ITS FOUNDATIONS-



—AND EXCEED IN VOLUME ANY OF THESE!

"CHINKS & MIKES"

Two people are alone . . . trapped in an Oriental "Chamber of Horrors"—when suddenly a mysterious voice speaks to them—apparently from nowhere! Such is one of the many surprise situations provided for the audience at the Comedy Theatre (where "The Silent House" is drawing thousands of people) by the "P.W." Technical Staff.

"FOR the last time, T'mala, *what did you do with those bonds?*"

The voice of the Chinese villain of the piece appears to come from some point on the stage, yet just where it originates is a puzzle not likely to be solved by a lay audience.

Wireless enthusiasts hearing it during one of the thrilling episodes of "The Silent House," at the Comedy Theatre, will probably be apt to suspect a whole battery of loud speakers concealed in nooks and crannies all over the stage, and it will very likely be something of a surprise to them to learn that only *one* is used, and that the elusive nature of the sound is simply obtained by taking advantage of the acoustic characteristics of the stage and auditorium.

Mr. Franklin Dyall as the villain of the piece.

The First "Snag."

Just how it is done has not previously been divulged, but it can now be disclosed that the whole scheme was worked out and installed by the POPULAR WIRELESS Technical Staff, and some details of the interesting problems encountered can be given, without going too deeply into technicalities.

Now, when the general requirements were first explained to the technical staff it did not sound a very difficult matter. It appeared that what was needed was a microphone and amplifier installation in a small room behind the stage, and a line connecting this to a loud speaker concealed somewhere amongst the stage scenery. But further details put rather a different complexion on the affair.

The first technical snag appeared when it was learned that the Chinese villain was to be played by Mr. Franklin Dyall, whose voice is a deep one, of a character to which the average loud speaker and amplifier would not take at all kindly.

The serious aspect of this difficulty was that it was absolutely essential that the audience should recognise the voice immediately, and therefore the reproduction *must* be reasonably natural, mere intelligibility being useless.

It was quite evident that any ordinary horn type of loud speaker was barred, and further that the amplifier must be specially designed to take good care of those lower frequencies of which we hear so much nowadays.

Furthermore, the amplifier must be capable of being brought into use by entirely non-technical operators, must require no adjustment before use, and must be one hundred per cent reliable.

The R.C. Amplifier.

Again, there must be no noticeable click from the loud speaker when it was turned on and off, and finally all the wiring must be carried beneath the floor. Fortunately, this latter point could be left in the hands of the theatre electrician, but the difficulties remaining were sufficiently formidable.

Finally, after much anxious debating of ways and means, an amplifier containing three stages of resistance coupling was built and tried out with a special loud speaker, success resulting after certain troubles had been eliminated.

(*Continued on next page.*)

Switching on the amplifier and "mike" circuits. The "mike" is in the box on the right, comfortably packed to avoid extraneous pick-up.

"CHINKS & MIKES."

(Continued from previous page.)

To obtain stability, however, it was found that a connection to earth was essential, the absence of such an "anchor" resulting in howling or ticking noises. This was not a particularly welcome discovery, since it was expected that there would probably be some difficulty in getting a good earth at the theatre, a fear which was later to prove only too well founded.

The microphone was obviously a very vital factor in getting realistic reproduction, and we were fortunate enough to be able to secure the use of an instrument of the type which is largely used for broadcasting. A good deal of time and ingenuity was then devoted to making a very completely shock-proof mounting for this, with a view to excluding all extraneous noise as far as possible, a very necessary proceeding when so high a degree of amplification is being attempted.

The Gear is Transported.

At last the preliminary tests were completed and it was considered safe to transfer the apparatus to the theatre and try it out at a rehearsal. The gear was piled into a taxi (which it completely filled) and then on arrival at the theatre there followed that lengthy procession along passages and up and down flights of steps which seems to be the inevitable consequence of an excursion into the mysterious regions technically known as "behind." The unlucky individual who had to carry the Ford starter battery which constituted the "juice" supply seemed to decide at about this time that the affair was not quite so amusing as he had anticipated!

For the first tests the amplifier was arranged on the floor in the wings with all its attendant gadgets laid out around it, and the loud speaker was placed in the centre of the stage.

While one of the "P.W." technical people was connecting up the gear another went in search of a good "earth," and very quickly learned that the prospect was very bleak indeed. There were no water pipes to be got at anywhere near the right spot, the radiator system was fed with steam, and the only hope seemed to be a gas pipe.

Searching for an "Earth."

It was evidently going to be a choice of the lesser evil, and the first test was to connect to one of the radiators. The outfit was switched on, and the loud speaker promptly gave a spirited imitation of a particularly able-bodied motor bicycle without a silencer.

Obviously, that "earth" was not good enough, so a gas pipe was tried. More "motor-biking." Then both earths were put on together, but the uproar was as bad as ever.

Next, the main gas pipe was located where it left the meter, and a connection made to the "ground" side of this. Result, same motor-bike still going strong.

It did not seem likely that *all* these different earths could be so bad as to provoke such virulent trouble, and the amplifier was naturally suspected of "taxi-sickness," but no sign of any broken connections or other fault could be found, and the technical people were observed to be muttering "*nice* little amplifier, what *can* be the matter with it?" (Well, something like that, anyway!)

Presently it occurred to someone to try earthing the microphone circuit as well as the amplifier, although this had not been necessary in the previous successful tests. It was done, and the amplifier was immediately restored to good behaviour.

Quite Satisfactory.

A very little testing then showed that Mr. Dyall's voice could be heard quite clearly and recognisably even at the back of the theatre, and the gear was transferred to the appointed spot in a small underground chamber to one side of the stage, whose main function appeared to be to hold the gigantic gas meter which supplies the theatre.

The innocent-looking rose-bowl loud speaker which causes such consternation on the stage in Act 2. Mr. Dyall as Dr. Chan Fu, the westernised Chinaman and villain of the piece.

After fitting everything up here it only remained to find out by trial just what distance should separate the speaker and the "mike," how loudly he should talk, and so on.

This occupied some time, but the final result was sufficiently good to repay in full for all the trials and tribulations which had been passed through, and when the rose-bowl loud speaker had been given a seat on a table on the stage the sense of illusion produced was quite startling.

A TUNING IMPROVISATION.

HAVE you ever experienced that annoying business of not being quite able to tune in a very promising-sounding station. You vary the dials of your receiver, passing various stations, and just at the maximum reading a very healthy signal is beginning to be heard. Hurriedly you change your coils only to find that that promising station has vanished amid a dozen others somewhere around the centre of the dial.

In this connection, here is a fact worth remembering. It is that a variable condenser with any other kind of dielectric except that of air will have an increased capacity. For instance, if the vanes of a ·0005 mfd. variable condenser were separated by ordinary notepaper instead of air the capacity would be increased to about ·001 mfd.

Therefore if that station of promise just begins to come in when all the vanes of your variable condenser are interleaved, go on tuning up by gently inserting thin pieces of paper between the vanes of the condenser, but see that the paper is clean and dry. There may be serious objections to this unorthodox practice, but the writer does not know them, and he has employed this cunning scheme several times to wheedle in stations which he might otherwise have lost altogether.

RADIO REMINDERS.

THE use of insufficient grid bias means that the high-tension battery will run down much sooner than necessary.

* * *

When a soldering iron has been filed clean, for tinning, the flux and solder should be applied *quickly*. It is important to avoid exposure to the air.

* * *

A screened aerial causes flat tuning, but a ·0001 mfd. condenser in series with it will sharpen up reception considerably.

* * *

A thin coating of petroleum jelly or vaseline will keep accumulator terminals in good condition indefinitely.

* * *

Quite a good little neutrodyne condenser can be formed by twisting two pieces of insulated wire together. The capacity can be varied by varying the lengths, one wire being, of course, connected to grid and the other to plate.

* * *

Very unpleasant distortion can be caused in your set by a neighbour whose set is left gently oscillating. (Similarly, if your set oscillates it will cause a neighbour's programme to be spoilt.)

* * *

There is a right and wrong way of connecting 'phones or loud speaker to a valve set. Be sure that the lead which is marked red or with a plus mark is connected towards H.T. plus.

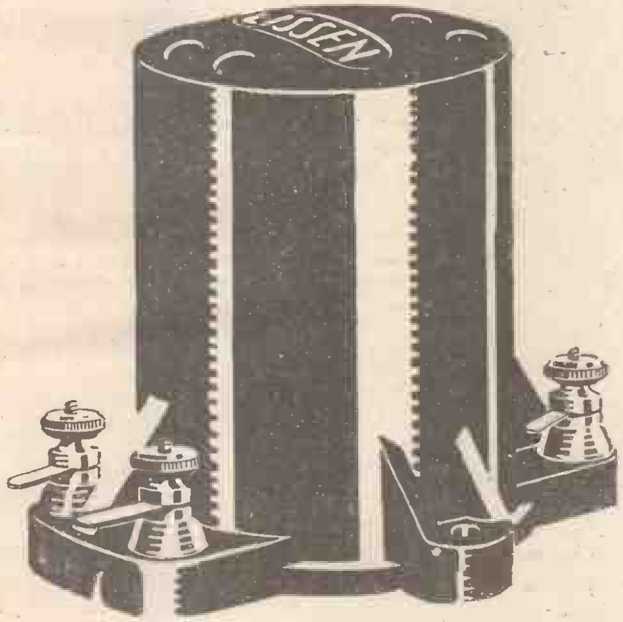
CAN BE BUILT WITH LISSEN PARTS

Congratulations to Messrs. Cossor on an excellent set.

IT has been definitely proved that LISSEN parts can be used for this Set with eminently satisfactory results, as well as for every other type of Circuit which may be popular at a given time, and which requires Standard parts of recognised quality.

LISSEN parts are guaranteed to give satisfaction every time they are used. Test the LISSEN TRANSFORMER against any other, and if you are then willing to part with your LISSEN, and return it within seven days of purchase, your money will be willingly refunded.

Use the other LISSEN parts as well, resistances, condensers, rheostats, valveholders, batteries, etc.



Lissen Parts for the Cossor Melody Maker

- 1 Lissen L.F. Transformer (Price 8/6).
- 1 Lissen ·001 Fixed Condenser (to be put across the primary of the L.F. Transformer) (Price 1/-).
- 1 Lissen Base-board Rheostat, 7 ohms (Price 1/6).
- 2 Lissen Key Switches or Lissen 2-way Switches (Price 1/6 each).
- 2 ·0003 Lissen Mica Fixed Condensers (grid leak clips are included) (Price 1/- each).
- 1 ·0001 Lissen Mica Fixed Condenser (Price 1/-).
- 1 ·001 Lissen Mica Fixed Condenser (Price 1/-).
- 1 ·002 Lissen Mica Fixed Condenser (Price 1/6).
- 1 Lissen Mansbridge type Condenser, 2 mfd. (Price 3/6).
- 1 Lissen Grid Leak, 3 meg. (Price 1/-) and 1 Lissen Combinator (Price 6d.).
- 1 Lissen Grid Leak, ·25 meg. (Price 1/-).
- 1 Lissen Grid Leak, 4 megs. (Price 1/-) and 1 Lissen Combinator (Price 6d.).
- 3 Lissen Valve Holders (Price 1/- each).
- 1 Lissen 9-volt Grid Bias Battery (Price 1/6 each).

Also use the Lissen H.T. Battery

All these Lissen parts for the Cossor Melody Maker are obtainable from 10,000 radio dealers throughout the country. Ask for Lissen parts in a way that shows you will take no other, and be sure of perfect results.

LISSEN GRID LEAK 1/-

LISSEN COMBINATOR 6d.

LISSEN

LISSEN LIMITED,
8-16, Friars Lane, Richmond, Surrey.
Managing Director: Thomas N. Cole.

To appreciate fully the perfection of present-day radio transmissions, you should hear them on an

AMPLION CONE

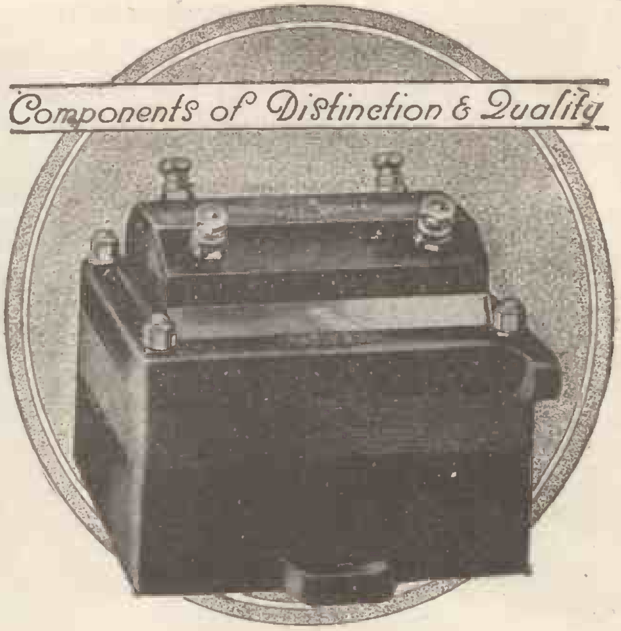
The Natural Tone Loud Speaker

Models from
37/6

"Chippendale" Mahogany
Model A.C.9. £7.0.0

Announcement of Graham Amplion Limited, 25, Savile Row, London, W.1

Components of Distinction & Quality



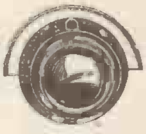
Low Frequency Transformers

Two years ago we decided upon the design of this Transformer, but the cost of turning out a component capable of so high a standard of performance was prohibitive. Since then, however, we have so lessened manufacturing costs that it is now possible to produce it at an economic price.

The windings of heavy gauge wire are sectional, giving a very low distributed capacity. The core is of "Stalloy", while the case is "Bakelite."

284	3 to 1 Ratio	£1 . 2 . 6
285	6 to 1 Ratio	£1 . 5 . 0
L.F. Transformer Multi Ratio (Ratios 1·8, 3, 3·66, 4·5 and 6 to 1) ..		£1 . 7 . 6
L.F. Choke Triple Impedance		£1 . 0 . 0

VARIABLE RESISTOR
5 ohms. or 30 ohms.
3/-



TWO SPEED DIAL
With Station Recorder 9/-

Send 1½d. in stamps for the new Bowyer-Lowe Catalogue.

TESTED RADIO
Bowyer-Lowe
APPARATUS

BOWYER-LOWE CO. LTD., LETCHWORTH

THE POSITION OF THE R.S.G.B.

REORGANISATION AND BIGGER MEMBERSHIP ESSENTIAL.

By **THE EDITOR.**

LAST week I suggested that the Radio Society of Great Britain, as at present organised, was not representative, in the full sense of the word, of the Radio amateur movement in this country.

Obviously, with a membership of under two thousand it cannot be; and without adequate membership it cannot "carry weight" when dealing with officialdom in matters relating to the welfare and prestige of British amateurs.

The R.S.G.B. is professedly an academic society, chiefly interested in maintaining its dignity and reputation as a "serious" body. Its traditions are undoubtedly excellent, but it is the very excellence of its traditions which now threatens to turn it into a hopelessly moribund society, without any great value except as a medium for circularising appeals for subscriptions and for organising, from time to time, technical lectures and meetings.

Beyond Its Strength.

If the R.S.G.B. did not claim to be the representative body of the British amateur movement, and if it did not, from time to time, negotiate with the P.M.G. with a view to obtaining concessions for the benefit of amateurs, there would be no case against the society: it would then be a semi-scientific body existing purely for the technical benefit of transmitters.

But it does attempt feats beyond its strength, and its consequent failures do considerable harm to amateurs in this country. These failures are not due to carelessness, or lack of sincerity or hard work; they are due, almost entirely, to an inherent weakness in the society and the society's constitution—lack of strength as regards membership, due to the fact that such membership has not proved much of an attraction, and, in any case, is not easy to obtain.

Experimental Reception.

The average amateur cannot join the R.S.G.B. unless he can satisfy the committee that he is a *bona fide* experimenter. That rule is all very well in its way, but *bona fide* experimenter in the eyes of the R.S.G.B. almost invariably means amateur transmitter, or a man who can show some years of intensive research work.

There are a few thousand transmitters in this country—but hundreds of thousands of amateurs who devote themselves to experimenting in methods of reception. These people should be encouraged to join the society, for their membership would strengthen it enormously, provide it with the necessary financial support, and, incidentally, a backing which would command attention and respect in official quarters.

The present conditions of membership are absurdly out of keeping with the times, and the society is not progressing as it should. Other societies have been formed which have absorbed much of the available material upon which the R.S.G.B. could have drawn, with advantage to itself and its members.

If it persists in its present ultra-conservative attitude, it is obvious that another and more virile society will have to be formed—a society for the amateur in the widest sense of the term.

There still exists a society for listeners, although its influence is weak and its powers waning through lack of initiative and proper organisation. In capable hands such an organisation could do much for the listener just as an organisation for the average amateur could do an immense amount of good. This week, for example, considerably more than 100,000 people will buy and read this journal—and "P.W.," however it may follow the modern trend of journalism by avoiding a dull and stodgy appearance and contents, is not entirely meant for the raw novice in amateur radio.

THIS YEAR'S SOLODYNE

Exclusive Constructional Details.

This Five-Valve Set gives results which would have necessitated at least ten valves two years ago.

With this set you will hear stations you have never heard before.

Full details of this magnificent Receiver will be found in

"MODERN WIRELESS"

On Sale

DECEMBER 31

A Free Blue Print of the Solodyne will be given away with every issue.

Order your copy now and avoid disappointment, for there will inevitably be a huge demand for the January **"MODERN WIRELESS"**

"P.W." caters for that ever-growing band of amateur enthusiasts who, debarred by red tape restrictions, by time to spare, cash, and other considerations, from erecting transmitters, devotes itself to the experimental side of reception—and the R.S.G.B. council should realise that here they have a potential membership which, if they had the sense to see it, would provide them with the strength they so sadly need.

But the average amateur has no use for the R.S.G.B. so long as its present rules of constitution remain in force, and so long as it turns up its nose and affects an air of superior dignity which goes ill with its recent record of achievement on behalf of the amateur movement.

The Reason Why.

At the time of writing, the R.S.G.B. council has decided against co-operation with "P.W." with a view to increasing the society's power and authority. The suggestions submitted to the society were, we understand rejected: the society is "satisfied with its position and rate of progress."

Well, if it is satisfied with under two thousand members—and the R.S.G.B. was formed in 1913!—it is very easily satisfied indeed; but it must, if it has any regard for veracity, cease to call itself the National Amateur Organisation. That it cannot be when it but represents a fraction of the amateurs in this country.

Here is a list of the reasons put forward by the R.S.G.B. why You should join it:

1. BECAUSE is is THE National Amateur Organisation. It was founded in 1913.
In 1923, when broadcasting was firmly established, the Society widened its scope to embrace the broadcast listener.
2. BECAUSE some of the most famous radio men in the country are members.
3. BECAUSE it is non-partisan and protects your interests by vigorously upholding your rights in all radio regulations.
4. BECAUSE it is the medium through which Amateurs can get together.
5. BECAUSE you will receive its Bulletin.
6. BECAUSE its distinctive emblem is recognised as the Badge of the leading national amateur organisation.

Paragraphs two and five are perfectly true.

Paragraph 1 is obviously ridiculous. The Wireless League, the Wireless Association, and the Radio Association have all "had the pick" of listeners; the R.S.G.B. may have a few, but they should have had so many that other Leagues and Societies need never have been formed.

Point 3 is sheer conceit: "vigorously upholding your rights in all radio regulations"! No comment is needed

Point 4 has a very limited application in actual practice, and applies to about 1,000—if not less—of the amateurs in this country.

What is the R.S.G.B. going to do about it?

BROADCAST NOTES

FROM OUR BROADCASTING CORRESPONDENTS.

"Ceremony of the Keys"—British and American Museums—Carols at Glasgow—Mr. Ponsonby on Diaries—Lady Hosie Again—The Story of Suez—Hogmanay—Manchester Reviews the Year—5 G B on New Year's Eve.

"Ceremony of the Keys."

EVER since the "Ceremony of the Keys" was broadcast in December of 1926, the B.B.C. has received numerous applications from listeners that it might be heard again. Arrangements have, therefore, been made to repeat it on Monday, January 16th. As most listeners will remember, the ceremony has been observed every night for the last six hundred years.

The Head Warder makes a formal tour round the historic building when, amid the sharp challenge of the sentries and the traditional replies, the ceremony of locking the gates with the old keys is carried out. The broadcast provided one of the most realistic mind-pictures of the year, the tramp of the soldiers and officials of the Tower "coming over" with wonderful accuracy.

The ceremony finishes with the final dismissal of the guard and the sounding of the Last Post and the playing of the National Anthem. It takes place shortly before 10 p.m., and the broadcast will probably be preceded, as was the case last year, with a talk on the various historical ceremonies which are observed at the Tower of London.

British and American Museums.

Sir Robert Witt, one of the original founders of the National Art Collections Fund, is visiting the London Studio at 9.15 p.m. on Tuesday, January 3rd, to give a talk in which he will draw comparisons between some of the great American museums and those of our own country.

Sir Robert has recently visited the United States, and his topic is of particular importance at the present moment by the fact that the Royal Commission, of which Sir Robert is a member, is considering various aspects associated with our national museums and galleries.

Carols at Glasgow.

Glasgow's Saturday programme (Xmas Eve) has a distinct "carolly flavour." During the afternoon, "Good King Wenceslas" and other seasonable airs will be given by the Station Singers, to be followed in the evening by a recital from Robert Donat, of his own special arrangement of Dickens' immortal "Christmas Carol." There will also be a recital of unpublished carols by the choir of St. Ninian's Episcopal Church. Edinburgh, Dundee, and Aberdeen has also arranged for carol singing to take a prominent part in the earlier part of their Christmas Eve programmes.

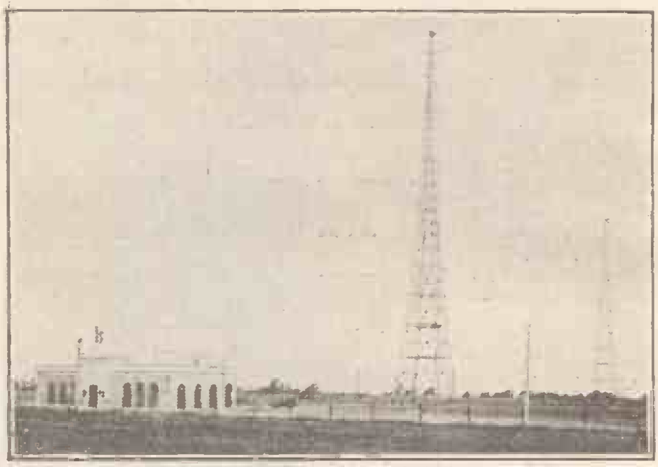
Mr. Ponsonby on Diaries.

Mr. Arthur Ponsonby, M.P., for the Brightside Division of Sheffield, holds a strong opinion that we should all keep a diary in some form or other. Perhaps the publication of this statement from such a distinguished Parliamentarian, who was principal private secretary to the late Sir Henry Campbell-Bannerman, may go a long way towards reducing the numbers of diaries for 1928 that are now stacked so high on the counters and shelves of stationers' shops, but there are many people who will profoundly disagree with Mr. Ponsonby's contention that it frequently happens that details, which to us seem of no importance, can be extremely interesting to succeeding generations.

Be that as it may, we must all acknowledge Mr. Ponsonby as an authority on diaries, because the search for and study of unusual specimens has long been one of his particular hobbies, in connection with which he has published more than one interesting book. Whatever may be our individual persuasions about diaries, Mr. Ponsonby's talk on "Keeping a Diary," which is to be broadcast from London and other stations at 9.15 p.m. on Wednesday, December 28th, is certain to be very fascinating.

Lady Hosie Again.

Those who heard the recent talk by Lady Hosie on Chinese life will look forward to her next visit to the London Studio on Thursday, December 29th, when she will give a seasonable talk on Chinese festivities under the title of "Yün Yün and Nieh Nieh Welcome the New Year." Lady Hosie is the daughter of Professor Edward Soothill, Professor of Chinese at Oxford University, who was President of the Imperial University of Shansi Province from 1907 to 1911. Her husband is also prominently associated with Chinese commercial life, so that Lady Hosie has had unique opportunities of becoming acquainted with and understanding Chinese characteristics.



The high-speed wireless telegraph station recently built at Lima (Peru). The power of the valve transmitter is 15kw. and the call sign is O A Z.

The Story of Suez.

Mr. Halford Ross, who is telling the story of the Suez Canal, the construction of which was one of the world's finest feats of engineering, in a talk which London and other stations are broadcasting on Tuesday, December 27th, is a much-travelled man. Since he left England some eighteen months ago to make observations of miners' phthisis and to organise preventive measures against mosquitoes and malaria in India he has twice crossed the equator, visited the Arctic Circle, and visited Japan, the Pacific Islands, Tibet, British Columbia and California. He has recorded the first part of his travels in a book, just published under the title of "By Devious Ways."

Hogmanay.

Always on December 31st Scotsmen the world over turn their thoughts to the Homeland, and Scotsmen at home remember their clansmen scattered throughout the earth. It is Hogmanay—Scotland's own festival, when in every home from the Tweed to John o' Groats the old stories and songs of Scotland are told and sung until the old year passes and "first-footers" go out to greet their friends in the New Year. All Scottish stations will relay a special Hogmanay programme which Aberdeen is arranging as an appropriate celebration of this important occasion. On the previous evening, Mr. Peter Malcolm, ex-Rector of Lockerbie Academy, who knows a lot more about Hogmanay than most people, will tell of the queer customs and traditions of the festival and their origin in a talk from the Glasgow studio.

Manchester Reviews the Year.

Although it is impossible to perform in seventy-five minutes all that listeners might like to hear again of a whole year's programmes, the concert which the Manchester Station is giving on Tuesday, December 27th, of excerpts from some of the outstanding operatic, dramatic and musical transmissions given during 1927, will no doubt revive memories of many pleasant evenings. The concert will include items from "La Traviata" and "I Pagliacci," a one-act play, "Whose Door," by R. H. Blackmore, performed last April, the tone poem "Tiel Eulenspiegel," by Strauss, heard on January 23rd, and Brahms' "Academic Festival," which figured in a special programme on February 2nd.

5 G B on New Year's Eve.

The New Year's Eve programme for the Daventry Experimental Station will consist of favourite orchestral tunes and items given by favourite radio artistes which have been heard by listeners during 1927. The artistes include Emilie Waldron (soprano), whose singing has been an attractive feature in the Birmingham programmes during the year, who will sing the Waltz Song from "Tom Jones," Dale Smith (baritone), some famous Sea Shanties; and Stainless Stephen (entertainer). Among the orchestral items will be the Overture to "Russlan and Ludmilla," and the Egyptian Ballet Suite.

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The Variable condensers in the Cossor Melody Maker were selected with care to ensure sharp tuning, fine adjustment and exact capacities—and so the choice fell upon the Ormond S.L.F. Condenser. No other condenser must replace it in this circuit, for upon the delicate adjustment of the Ormond Slow Motion dials depends the razor-sharp tuning and extreme selectivity of the set.

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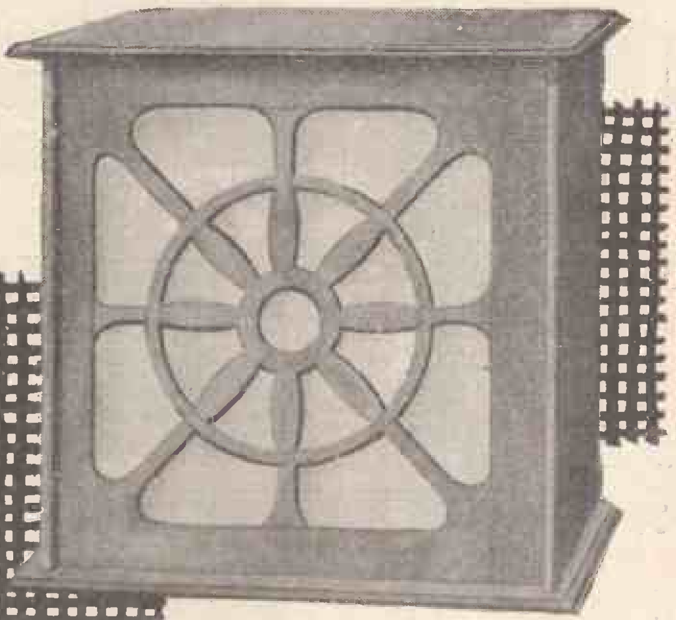

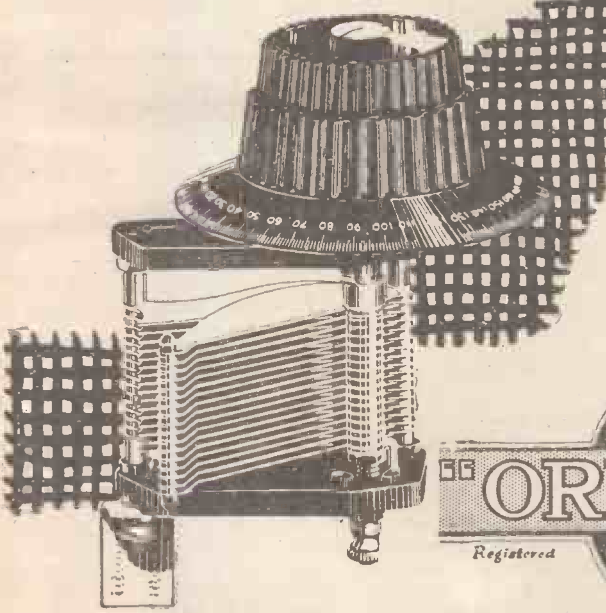

THE ORMOND "IDEAL" LOUD SPEAKER

is especially recommended for use with the Cossor Melody Maker—to it is due in no small part the ultimate perfection of the reproduction you secure with this new circuit. The Ormond "Ideal" was chosen from among the multitude of loud speakers by comparison—the test which you should apply. Ask your radio dealer to let you hear it. **Price £3 : 3 : 0**

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Drilled Panel and Terminal Strip, Low Loss Coil Former, 3 Redfern Valve Holders.

The Set complete:—

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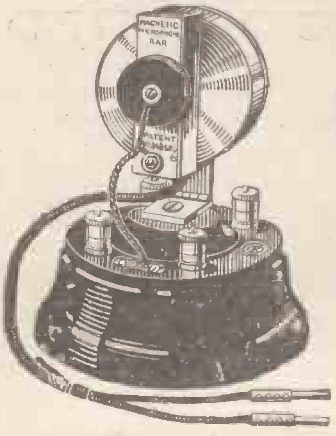

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TECHNICAL NOTES

By Dr. J. H. T. ROBERTS, F.Inst.P.

L.T. FROM THE MAINS.

ETHER DRIFT—NEW PHOTO-ELECTRIC CELLS—TELEVISION ABROAD—CATHODE RAY SYSTEM.

L.T. From the Mains.

A NEW design of low-tension power supply unit has just been introduced on the American market which employs an entirely novel internal system. It provides 2 amps. at 6 volts for heating the filaments, and the running cost is claimed to be very low.

The circuit includes a rectifier and filter, and the unit is built into a compact case, the whole device weighing less than 15 pounds. It does not contain a storage battery of any kind and requires practically no attention.

For the rectifier an electrolytic cell is employed. The electrolyte is made by adding water to a powder which is already in the cell. In addition to the electrolytic rectifier there is a large capacity electrolytic condenser, as well as the choke coils. A curious feature about the device is that the electrolytic condenser employs the same electrolyte as is used in the rectifier. The condenser has two sets of plates submerged in the liquid and electrically is employed as two separate condensers. The electrical design is such that the outside plates of the filter condenser act also as the non-rectifying or neutral electrode of the electrolytic rectifier.

Ether Drift.

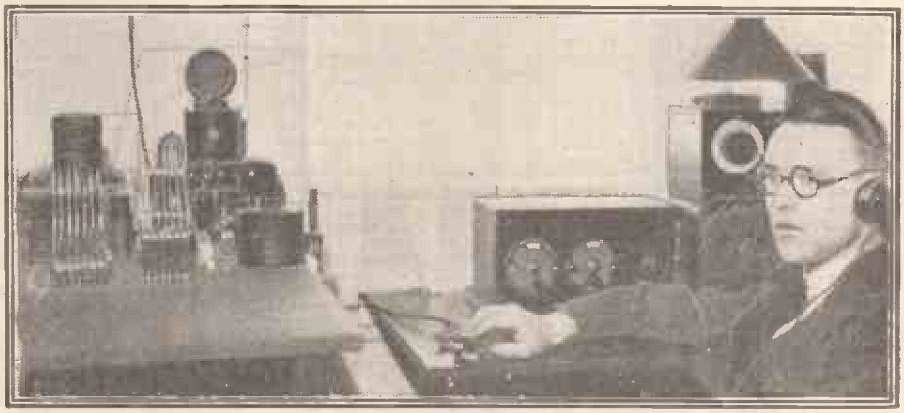
The question of an ether drift between the earth and the ether has always been a subject for scientific controversy. Many experiments have been carried out, designed to have a direct bearing on this question, of which probably the best-known is the famous Michelson-Morley experiment tried many years ago in the United States. This experiment has been repeated with various modifications from time to time and the very greatest possible refinements have been introduced. Notwithstanding the extreme care and skill devoted to the repetitions of the experiment, however, it has yielded negative results so far as ether drift is concerned.

Recently, some important experiments have been carried out at the Mount Wilson Observatory by Professor Miller, as a result of which it is claimed that evidence of ether drift has been obtained. This, again, is disputed by other scientists who have given arguments to show that the drift observed by Miller is more likely to be due to local disturbances. Of course, any experiments designed to indicate ether drift in this way need to be carried out with the utmost possible accuracy, as the drift itself, if it exists at all, would in any case be exceedingly difficult to observe.

New Photo-Electric Cells.

Some new photo-electric cells, which may be applied for a variety of laboratory experiments, have been introduced by the G.-M. Scientific Manufacturing Company (U.S.A.). Five tubes have been brought out up to the present, of which three are described as photo-electric cells and two as neon glow-lamps.

An approach to the "electric eye" is found in the alkaline-hydride photo-electric cell. This device, which is extremely sensitive to light and to variations in intensity and colour of light, transforms optical variations into variations in electric current. Furthermore, the cell responds to these effects with extreme rapidity and with a high degree of precision. The current which passes through the cell, under proper conditions, is stated to be directly proportional to the intensity of the illumination, as well, of course, as to the area of the sensitive surface which is illuminated. The photo-electric cell may be looked upon as a variable resistor, the resistance of which is determined by the illumination which falls upon it.



A well-known American amateur, Robert Hart, of Hartsdale, N.Y., operating his short-wave transmitting station, U-2 C V J.

This cell may be employed for a great variety of purposes for which at present it is only possible to use the human eye.

It is applicable to the transmission of photographs by wire or radio, the improved recording of sound on gramophone records, the reproduction of sound in talking movies, the transmission of moving pictures, the automatic operation of electro-magnetic relays, for the control of artificial illumination, operation of fire-alarms, inspection of materials according to colour, grading, and so on.

Television Abroad.

It is not commonly known that experiments in television, or the sending of moving pictures by wireless, date quite a number of years back and are proceeding in various parts of the world. I have referred previously in these Notes to the work of the American Telephone and Telegraph Company, and of Dr. Alexanderson and Mr. C. F. Jenkins, in the United States, whilst the work of Monsieur Belin in France is also well-known.

A young Hungarian engineer, Denes von Mihaly, who is consulting engineer to the A.E.G. (the General Electric Company of Germany), has progressed further than anyone else in the world, according to Mr. W. J. Brittain, a writer in the well-known United States journal, "Radio Broadcast." Mr. Brittain made a special journey to Europe in order to investigate the position of television development generally, and he went back to America full of enthusiasm for von Mihaly's work, and for the demonstration which was given.

Mr. Brittain says: "It was the writer's privilege to be present at a recent demonstration of Mihaly's apparatus. Results obtained were considerably better than those of the early demonstrations, and the images were clearer than those seen by the author on Baird's screen. On the picture of a 'televised' boy it was possible to see the collar, the wavy outline of the hair, the shape of the ear, the forehead, the eye, the nose and the mouth, the latter merging into shadow on the left side of the face."

Light-Sensitive Cell.

One of the most important parts of von Mihaly's apparatus is the light-sensitive or photo-electric cell, which he has developed in his own laboratory, and which is a great secret. "Television sets for the home," he says, "will be sold in a few months for about twenty pounds."

Von Mihaly has been working for thirteen years on television. He gave his first demonstration on July 7th, 1919, when Hungarian ministers in the laboratory of the Telephon Fabrik, in Budapest, saw the representation of letters upon a screen transmitted from the young engineer's home laboratory in another part of the city.

Cathode Ray System.

Messrs. Belin and Holweck are working actively upon their television system in Paris, using a special form of cathode ray oscillograph.

Mihaly's Apparatus.

In regard to Mihaly's apparatus, an engineer has gone from America to Germany for the purpose of making a simplified version of von Mihaly's machine to be shown in Berlin and London as a preliminary to forming two television companies in those cities.

IF THERE IS ANYTHING IN THIS ISSUE OF "P.W." YOU DO NOT LIKE, PLEASE LET US KNOW ABOUT IT.

Apparatus Tested

Traders and manufacturers are invited to submit wireless sets and components to the "P.W." Technical Department for test. All tests are carried out with strict impartiality in the "P.W." test-room, under the supervision of the Technical Editor, and the general reader is asked to note that this weekly article is also intended to provide a reliable and unbiased guide as to what to buy and what to avoid.—EDITOR.

NEW EDISWAN R.C. "THREESOME."

WE were recently sent a set of components and valves for the construction and operation of the new Ediswan R.C. "Threesome." The R.C. "Threesome." as its name suggests, is a three-valve receiver and employs a grid leak rectifier followed by two resistance-capacity-coupled low-frequency stages. Magnetic reaction is obtained by the usual two-way coil holder scheme, and a single variable condenser carries out the tuning. The main components are this variable condenser, the two-way coil holder, and three R.C. coupling units. Each unit carries a valve holder and on two are grid leaks and anode resistances, and on the other a grid leak and grid condenser.

A great number of the connections are carried out automatically in a very ingenious manner. Each of the three so-called R.C. units has on one side three sockets and on the other three plugs. Previous to screwing down on the baseboard the three units are all linked together by means of this simple plug and socket system, and thus a great portion of the wiring is accomplished before the real work of construction actually begins.

Messrs. Ediswan supply free a large blue print and an instruction booklet. Another vital item in the outfit is a combination multiple flexible battery lead. This terminates at the one end in a two-socket plug and two separate leads provided with ring terminals. At the other end of the cable are the various battery terminals, each of which is very clearly marked.

The assembly of this R.C. "Threesome" is simplicity itself, for after the three or four items have been mounted on the panel and baseboard there remains but five wiring connections, and as none of these connections needs to be soldered, we do not think that it would be possible to devise a simpler method of receiver assembly.

The R.C. "Threesome" makes a fairly good local station loud-speaker set. As the makers state: "It is essentially a receiver for the reception of the local station and high-power station transmissions but, since reaction and leaky grid rectification are now incorporated, many additional stations at home and abroad are well within the receiver's range. Just how many home and foreign stations are received at good loud-speaker strength on each individual R.C. 'Threesome' depends upon the conditions under which the set ordinarily functions." The only real criticism that can be made against the receiver is that it is not particularly selective, but the addition of a very simple wave-trap would overcome this objection. The complete receiver can be built for a sum of fifty shillings or less.

THREE HARLIE COMPONENTS.

Messrs. Harlie Bros. have produced a combined valve holder and filament rheostat. The anti-microphonic valve holder forms the upper part of the device, while on the side is a vertical control which enables the rheostat in the base to be adjusted. This latter in itself is of normal design, but the drive is through a smooth gearing, which gives a positive contact throughout the range of movement. This ingenious component is well made, and by its saving in wiring and space should appeal to the practical amateur. It is obtainable in resistances of 6, 15 and 30 ohms at 3s. 6d., a price which very favourably compares with the outlay necessitated

(*Continued on page 900.*)

"The Silent House"
ROSE BOWL LOUDSPEAKER

As used at the Comedy Theatre, and installed by the "P.W." Technical Staff.

You must read all about the mysterious voice. See "Chinks and Mikes," on pages 889 and 890 of this issue.

THE "BECO" ROSE BOWL LOUDSPEAKER
is of Elegant Design. Highly Artistic Appearance.
Gives Good Volume and Faithful Reproduction.
SIZE: Height 8 inches. Diameter 10½ inches.
YOUR LOCAL DEALER WILL DEMONSTRATE ONE TO YOU.
PRICES:
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REFINEMENT L&P IN RADIO

You'll wish you'd built the
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EXPRESS
They're telling us
It's Better!

Ask your Wireless dealer for
FREE COPY
of circuit.

THERE IS NO SUBSTITUTE

A 66-VOLT BATTERY is better than A 60-VOLT BATTERY

A 66 volt Battery will give you louder and better reception than a 60-volt Battery.

66 volts in a Battery instead of 60 volts will prolong the effective life of your Battery proportionately.

The LISSEN Battery, although marked 60 v., swings the volt-meter needle to well over 66 v. when you buy it—you can see this for yourself.

The LISSEN Battery is often 60 volts after you have had it in use for three months.

The higher voltage maintained in the LISSEN Battery by the new LISSEN process prevents valve distortion, and gives you clear, loud reception throughout the entire life of the Battery.

Buy a LISSEN Battery always—ask for it in a way that shows you will take no other.

60 v. (actually 66 v.) -	price 7/11
100 v. (actually 108 v.) -	price 12/11
9 v. - - - - - -	price 1/6

Obtainable at 10,000 Radio Dealers throughout the country.

APPARATUS TESTED.

(Continued from page 898.)

by the purchase of the separate items which it comprises.

Another new Harlie production is a slow-motion dial and indicator. This provides the now usual hairline scale indication with, additionally, two apertures in which can be written station names or call signs. It can be fitted to practically any variable, and has the useful reduction ration of 12 to 1. Another feature is that there is practically no metal used in its construction. It embodies a cog-wheel drive, but while this enables definite settings to be obtained, it cannot quite achieve the velvety smoothness of the friction-drive dial. Nevertheless, it is very well made, and perfectly satisfactory in operation, and at the price of 3s. 9d. appears to us to represent very good value for money.

The final Harlie item we have to review on this occasion is a seven-way battery connector. A neat seven-point socket is provided for panel mounting, and into this the plug at the one end of the multiple table can only be inserted in the one correct manner. At the other end of the cable the various leads are very plainly marked by means of metal tablets which are both numbered and carry indicative lettering. The cable is just over a yard long and is flexible and strong.

Such a cable is certainly just the thing to make more neat the average houschold set. The accumulator leads seem to be taken out at just the right length, and the H.T. and grid-bias leads group in the manner which makes for neat and tidy connections. The price of this Harlie seven-way battery connector is 9s. 6d.

CLIX RAINBOW TERMINALS.

The latest production of Lectrolinx Ltd., Vauxhall Bridge Road, S.W.1, famous for their "Clix" products, is the Clix Rainbow Terminal. This is an ingenious combination terminal which will take any sort of connection, and which is supplied with a coloured identity ring. The terminal itself is fitted with a very brightly-coloured knob and this is made to correspond with the coloured collar of the pin or spade terminal with which it is used.

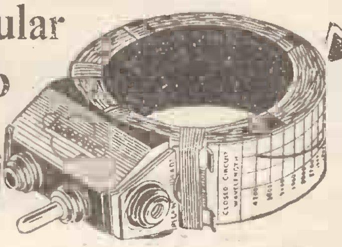
The terminal is supplied in nine distinctive colours, so that this number of separate connections can be catered for. A set incorporating these "Rainbow" terminals should be attractive in appearance while wrong and dangerous battery connections can hardly be made. The "Rainbow" terminal, complete with a coloured collar for affixing to pin or spade connectors, costs 5d. It is heavily made and well worth the money.

LAMPLUGH "POPULAR" SET.

The illustration of the above receiver accompanying Messrs. Lamplugh's advertisement in our issue of December 17th was inadvertently placed at a wrong angle, giving the impression that the back slopes forward. This is incorrect, the back, front and sides are all vertical as shown in previous illustrations of these well-known 2 and 3-valve sets.

A Graham Amplion Band Repeater outfit installed in a well-known cinema. A feature of the loud-speaker-film collaboration was the reproduction of realistic animal noises.

The Ever Popular Honeycomb Coil



Fashions in coils change often, but it is significant that more Igranic Triple Honeycomb Coils are used to-day than ever before.

The reason lies in the formation of the winding, which is based on a principle fundamentally sound and which is recognised as giving the lowest self-capacity attainable for a given inductance.

By constant improvement in detail **Igranic Triple Honeycomb Coils** have kept the lead and remain unrivalled for the highest electrical efficiency and robustness of construction allied with adaptability for use in any circuit.

Send for List No. R. 76 for full particulars.

Igranic components are always stocked by reputable dealers. All reports received by us of difficulty in obtaining them receive immediate attention.

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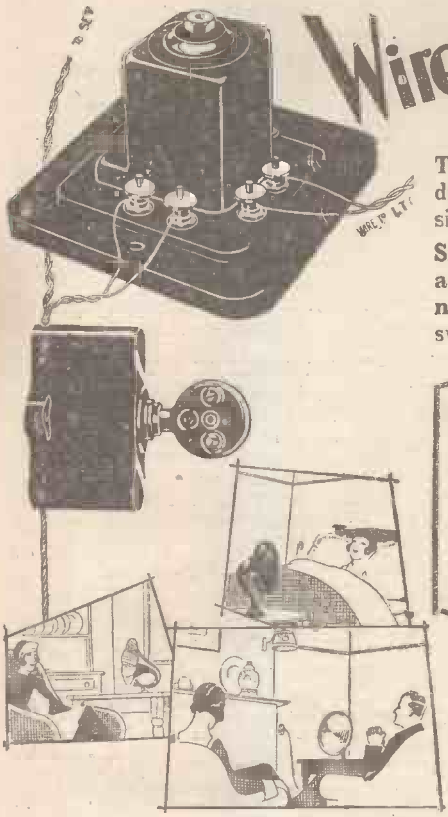

Wireless in every room this Winter

THE LOTUS REMOTE CONTROL enables you to listen-in in the dining room, sitting room, bedroom, kitchen—everywhere—anywhere, simultaneously and without interference with each other.

Simply place the Lotus Relay near receiving set, wire up to rooms desired and connect with Wall Jack and Plug. No technical knowledge is needed. The same volume of sound throughout. The last one to switch off automatically disconnects the set. Suitable for any valve set.

Complete Outfit for Wiring Two Rooms:

With set using L.T. Accumulator and H.T. Battery ..	30/-
With set using L.T. Accumulator and H.T. Eliminator	45/-
With "All from the Mains" set	40/-

From all Radio Dealers;

THE LOTUS REMOTE CONTROL

Made by the makers of the Lotus Valve Holder, Lotus Vernier Coil Holder, and Jacks, Switches and Plugs.

Tear off here—

FREE!

Please send me FREE BLUEPRINTS and Instructions explaining how two rooms can be wired in half an hour.

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Name..........
Address..........
.... P.W.24:12.27.

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Specify
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Apply for particulars of our new foot-proof 4 and 6 contact Former with bases ready for winding, directions and fully illustrated booklet. Price 6d.

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—IT SIMPLIFIES SOLDERING

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All Hardware and Ironmongery Stores sell FLUXITE in tins, price 8d., 1/4 and 2/8. Another use for Fluxite—Hardening Tools and Case Hardening. Ask for leaflets on improved methods.

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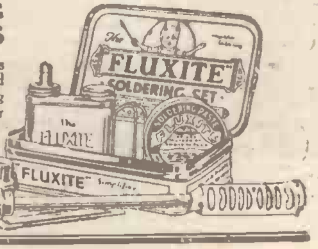

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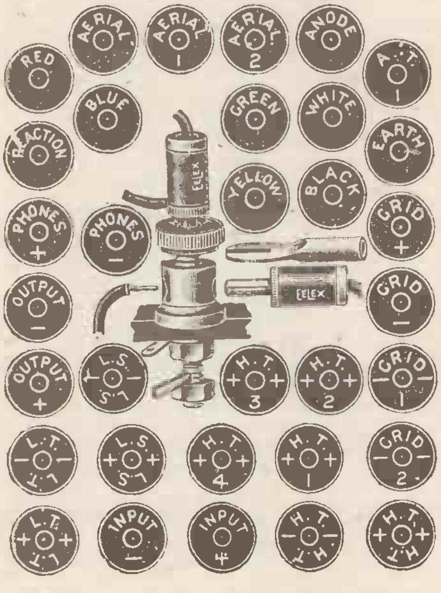
TREBLE-DUTY TERMINALS



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2. Plugs can be secured at top or side of terminal.
3. 26 indicating tops, + Red-Black, and in White, Black, Blue, Green, Red & Yellow.
4. Slotted stem to save soldering internal joints.
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7. Standard Eelex Fittings are interchangeable.
8. Cheaper than any other nickel-plated terminal, with indicating top.
9. Chosen by leading designers and manufacturers, and millions being used by amateurs.

Terminal (T2LC). Price 4½d. each.
With Plain Top. 3d. each (T2LN).

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RADIOTORIAL

All Editorial Communications to be addressed to The Editor, POPULAR WIRELESS, The Fleetway House, Farringdon Street, London, E.C.4.

The Editor will be pleased to consider articles and photographs dealing with all subjects appertaining to wireless work. The Editor cannot accept responsibility for manuscripts and photos. Every care will be taken to return MSS. not accepted for publication. A stamped and addressed envelope must be sent with every article. All inquiries concerning advertising rates, etc., to be addressed to the Sole Agents, Messrs. John H. Lile, Ltd., 4, Ludgate Circus, London, E.C.4.

The constructional articles which appear from time to time in this journal are the outcome of research and experimental work, carried out with a view to improving the technique of wireless receivers. As much of the information given in the columns of this paper concerns the most recent developments in the radio world, some of the arrangements and specialities described may be the subject of Letters Patent, and the amateur and the trader would be well advised to obtain permission of the patentees to use the patents before doing so.

QUESTIONS AND ANSWERS.

THE LOST CHORDS.

H. T. E. H. (Longton, Staffordshire).—"Not till I changed over from H.T. batteries to my eliminator did I realise how good wireless music can be—the volume was greater, and the chords rang out full and perfectly clear. No trace of harshness or distortion anywhere. For nine weeks I have been enjoying this perfect reception, but suddenly it has gone phut. Nothing has been touched, but all the volume and tone went suddenly one night, and the set is not worth listening to now. What could cause such a sudden and disappointing failure?

It may help you to know that if I move the H.T. + or neg. plug in the eliminator now I get a bright little spark every time, but prior to the set going wrong I never noticed a spark there at all."

Probably one of your smoothing condensers has "gone west." This could easily give rise to all the symptoms you name, and it would be likely to develop suddenly in the way you describe. Try disconnecting them one at a time, and if volume returns, discard the disconnected condenser and replace it with a good quality one of the same or a larger value.

GRID LEAK CAUSES DISTORTION.

C. J. (Burton-on-Trent).—"Since I fitted the new grid leak I get harshness on certain notes. Could the new leak be the cause, or is it just a coincidence that I never noticed this before?"

Probably the leak is at the root of the trouble, as an unsuitable resistance value will cause distortion and harshness.

THE R SCALE OF STRENGTH.

H. L. W. (Grantham, Lincs).—"Looking through 'P.W.' I have often seen letters referring to signal strength as being 'R5,' or 'R3,' etc. What does R followed by the number mean? I am told that amateurs use such a scale for comparison of signal strength. Is this the case?"

Yes, the strength of signals received is generally denoted by the letter R. followed by a number. The weakest signals are called R1, and the strongest R9, the scale of comparison now in general use by amateurs all over the world being on the following basis:

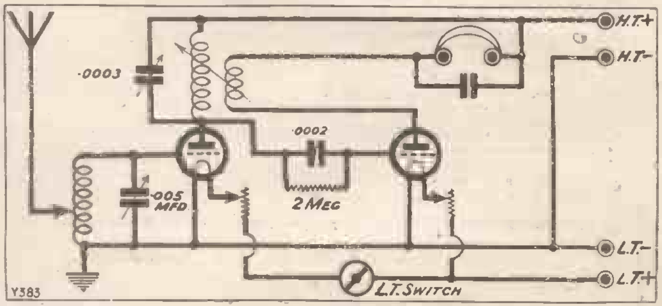
R1—Faint signals (only just readable).
R2—Weak signals (barely readable).
R3—Weak, but readable.
R4—Fair, easily readable.
R5—Moderately strong.
R6—Strong.
R7—Good and strong, readable through atmospherics or jamming.
R8—Very strong (readable several feet from the 'phones).
R9—Extremely strong.

SHOCKS FROM THE BOX.

Electric (Ross-on-Wye).—"Why is it that I am always getting shocks from the new set? Though I used the same batteries, I never had this trouble before, but now if I change a coil in the screening-box, or adjust H.T. I seem to get sharp shocks everywhere. Is there anything wrong?

Nothing is wrong, but the fact that the screening box is connected to H.T. neg. means that to touch the box is equivalent to "touching" the H.T. battery, so shocks will be felt if the H.T. positive is handled at the same time. (Incidentally, it is very easy to short a battery by touching leads or screening boxes, so care should be taken to avoid this.)

WHAT IS WRONG?



The above diagram is supposed to represent the connections of an H.F. (Tuned Anode) and Det. receiver. But it is wrong and the set would not work.

Next week the correct diagram will be given, and to test your skill we shall continue to publish every week a diagram in which a mistake (or mistakes) has been inserted. The correction will be published the following week.

No prizes are offered, but by following this series and trying to solve the problems week by week the reader cannot fail to learn a lot about radio circuits.

AMERICA DIRECT ON ONE VALVE.

"**Suspicious**" (Ely, Cambs).—"This talk about picking up America on one valve—

(*Continued on page 904.*)

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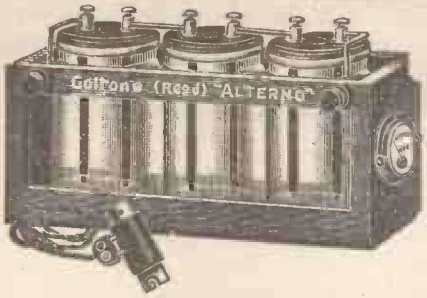

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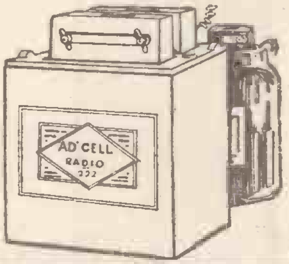

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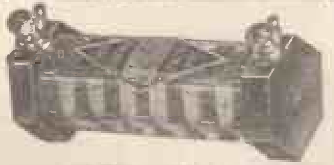

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RADIOTORIAL QUESTIONS AND ANSWERS

(*Continued from page 902.*)

not relayed, but tuned in right over the Atlantic. Surely that is not true? Or, at least, if it has been done, I suppose it was only a fluke that isn't likely to be repeated?"

You know, you really ought not to be so "suspicious"—living in a cathedral town, too! For it is a sober fact that American broadcasting is being picked up direct all over the country after about ten in the evening. A one-valve set will do it, but generally a two is better. The secret is "short waves." We don't often hear the American programmes on 300 metres or so, but some stations duplicate their transmission on 32 or 45 metres, and it is these shortwave programmes that cover the distance so amazingly.

FILADYNE ON SHORT WAVES.

H. N. (Govan, Glasgow).—"Can the Filadyne type of circuit be used for short-wave reception?"

Yes. Remarkably good short-wave results have been obtained with one and two-valve Filadyne sets.

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A postcard will do: On receipt of this an Application Form will be sent to you free and post free, immediately. This application will place you under no obligation whatever, but having the form you will know exactly what information we require to have before us in order to solve your problems.

IS BROADCASTING INSTANTANEOUS?

R. E. J. (Brighton).—"What I would like to know is this: Can I calculate how long it takes the broadcasting to travel from 2 L O's aerial to mine? The distance from London is just about fifty miles, and my friends tell me that no time at all elapses between a word being spoken at 2 L O and its reception here in Brighton. But that looks wrong to me, and I should like to prove to them that wireless *does* take time to travel, even if it moves as fast as light."

You are quite right in contending that some time elapses between the dispatch from London and the arrival at Brighton, but it is not very long! The wireless waves travel at the rate of 186,000 miles per second, so that to find how long they take to cover fifty miles you can divide that figure into 186,000. The answer is

$$\frac{186,000}{50} = 3,720$$

so that wireless can do the London-Brighton journey 3,720 times in one second; that is to say, the waves take 1-3,720th of a second to get from 2 L O's aerial to yours. And your friends aren't far out in calling it "instantaneous," are they?

LOUD-SPEAKER LEADS.

J. P. A. (Derby).—"My loud speaker is marked with a plus and a minus, but the terminals on the set are not marked; at

(*Continued on page 906.*)

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RD40 .. 2/-
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A RADIO EXPERT writes:—
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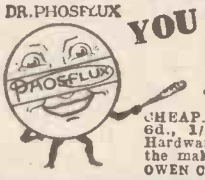

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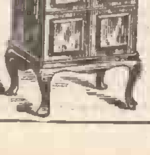

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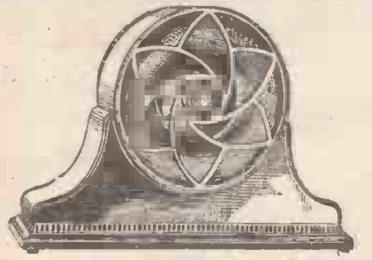

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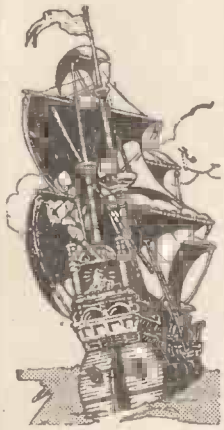

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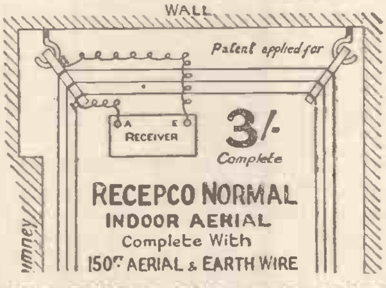

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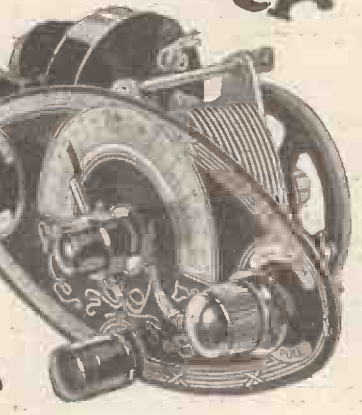

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RADIO-TORIAL QUESTIONS AND ANSWERS

(*Continued from page* 904.)

least, they are marked 'L.S.', but nothing else. I know nothing at all about wireless, so how do I know which side to connect the plus and which minus?"

Have a peep inside the set, and you will notice that one of the loud-speaker terminals is joined to the H.T. positive terminal. (If the set has two H.T. positives, it will probably be to H.T.+ number 2; if three, H.T.+ number 3, etc.) Mark this loud-speaker terminal with a +. The other L.S. terminal will be connected to the plate socket of the last valve, and this one is the one to which is connected the loud speaker's minus lead.

THE EXTRA TERMINAL.

E. D. I. (Ely, Cambs).—"I have bought an American audio-frequency transformer and I do not understand the marking of the terminals, which is as follows: A, B+, C and G. There is a fifth terminal which is marked Gr. How should these all be connected?"

The terminal marked A corresponds to plate; that marked B+ to H.T. + C means grid bias negative, and G means grid. The terminal which is marked Gr is intended to be connected to earth, which in America is called "ground."

"SILENT-POINT" RECEPTION.

E. T. (Hunstanton, Norfolk).—"What is 'silent-point' reception?"

Silent-point reception is one of the greatest nuisances under the sun. It gets its name from the fact that although a set using too much reaction generally whistles or howls, there is one particular "adjustment" for it which gives a comparatively silent point, even when it is oscillating.

When adjusted under these conditions reception is louder than normal, but it is harsh and distorted, and it is invariably causing very bad interference in all neighbouring sets.

As this spoils everybody's enjoyment of the ether, we hope, E. T., you are not experiencing an outbreak of "silent-point" disease in Hunstanton.

ADJUSTING THE LOUD SPEAKER.

J. A. R. (King's Norton, Birmingham).—"I do not understand the necessity for adjusting the loud speaker. What is the knob at the back for?"

The action of the loud speaker depends upon the fact that it contains a permanent magnet which exerts a steady pull upon the diaphragm. In addition, it contains electro-magnets, which either resist or oppose the permanent magnet according to the currents flowing round the wire. To get the maximum effect the diaphragm must be attracted strongly towards the permanent magnet, but not too strongly. The adjusting screw is for the purpose of varying the distance between the permanent magnet and the diaphragm so that any desired degree of "pull" is obtainable.

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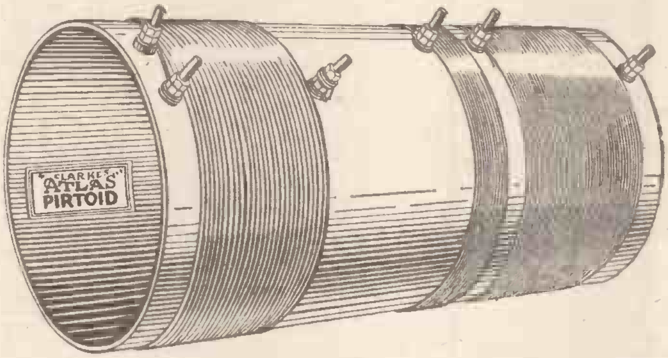

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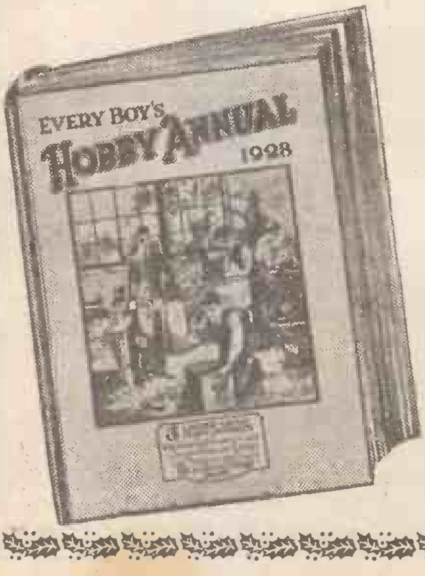

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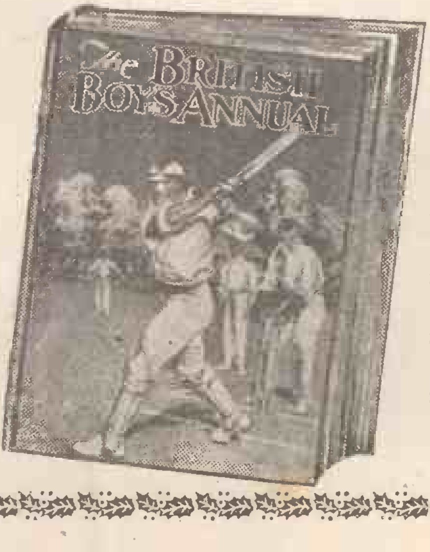

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218, Upper Thames St., E.C.4

SHORT-WAVE NOTES.

By W. L. S.

At last there actually seems to be some sign of activity awakening on wave-lengths other than the 45-metre band! The Americans, of course, have been using 20 metres with great success for quite a long time, but it is only recently that any considerable number of Europeans have made themselves heard on this wave-length, and there is certainly a rapidly growing number of them at work now.

Speech Tests.

Finland, Norway, Sweden, and Russia seem to come in much better on the 20-metre band than on the upper wave-lengths, and even the British stations are sometimes quite strong. With regard to 90 metres, quite a few British stations are using this as a "gossip wave-length" on Monday nights. It certainly is a treat to get away from hunting "DX" and to have a chat with old friends, especially when, as is the case now, one has 180 degrees of condenser-scale populated by about eight stations! Ninety metres is certainly a wonderful wave-length for uninterrupted conversations.

2 X G seems to be on a different wave-length almost every night. The writer heard him a few nights back on exactly 46 metres, giving out his usual "write down Shakespeare, etc, etc." These word tests are quite interesting, as they show up the difficulty in following a voice that only speaks casually and repeats nothing, when the station is subject to fading. Whether the authorities intend to learn anything about the actual fading of the signals from them is a different matter, but it seems that when a word is missed it is almost equally due to fading, interference, and the enunciation of the person reading the words out.

The "Critical" Wave-length.

How long will it be before someone really discovers the "critical wave-length" at which waves are no longer refracted in the Heaviside layer and returned to the earth, but pass right out into space through the layer? It seems possible that all sorts of extraordinary things may happen to transmissions on this *exact* wave-length. It is generally believed to be somewhere in the neighbourhood of 10 or 12 metres. Perhaps this is something to do with the rumour that 5 S W is going to start up experimentally on 10 metres?

It is almost impossible to publish a "time-table" giving the best times to listen for the different countries on wave-lengths below 30 metres. This time last year, when the 38-45-metre band was more universally in use, it was generally possible to compile such a table, but the shorter waves are much more erratic. United States stations on 20 metres, for instance, are sometimes at their strongest at about 5 p.m. Yet on other days they have been very strong at mid-day and noticeably fading out by 2 p.m. Truly there is much to be learnt before we think of descending any further in the scale!

LAKER STEEL MASTS are 100 per cent. efficient

They are made by engineers and supplied to H.M. Government, the B.B.C., and to Colonial and foreign stations throughout the world. There are 50,000 "Laker" Masts in daily use. By mass production we are able to offer a wonderfully efficient and handsome Steel mast at the extraordinarily low price of 22/6 complete, as illustrated. Send 1/6 extra for part carriage. We pay the rest. Buy a Laker Mast for good reception.

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This component enables valves in parallel to deal with twice the grid swing, resulting in much stronger signals. Special care has been taken to see that there is sufficient iron content. The R.I. and Varley Push-Pull Output Transformer has been carefully designed to give the best possible performances in push-pull practice, and is suitable for use directly coupled to loudspeakers whose D.C. resistance is between 650 and 2,000 ohms. 22/6.

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This is the only Output Transformer on the market that has both ratios combined in the one component. It prevents the direct current supplied to the anode of the valve from traversing the loud speaker, and so causing distortion. 21/-.

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22/6

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R/R

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MUSICAL OSCILLATIONS (See Page 915.)

Popular Wireless

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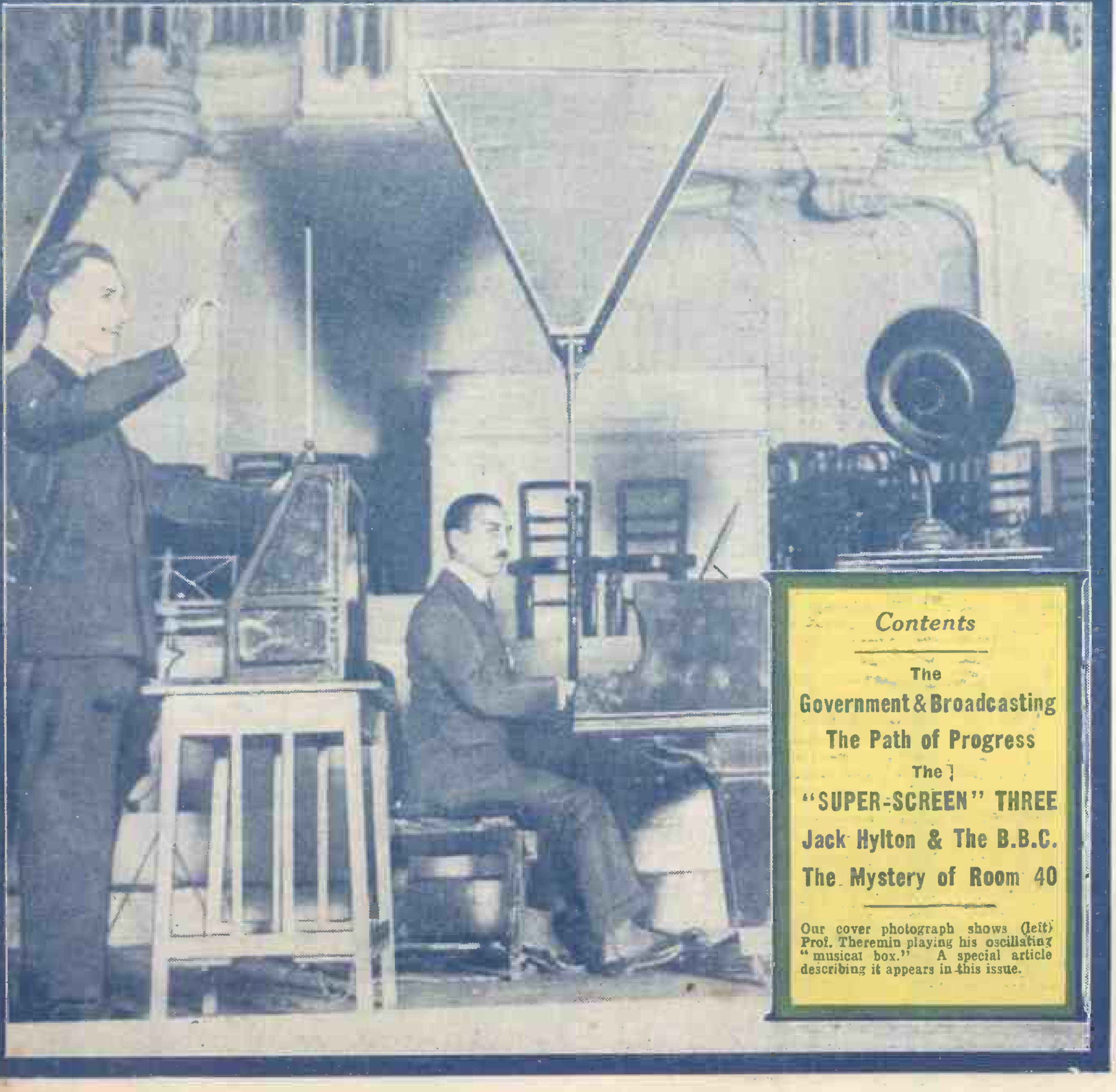
INCORPORATING "WIRELESS"

December 31st, 1927.



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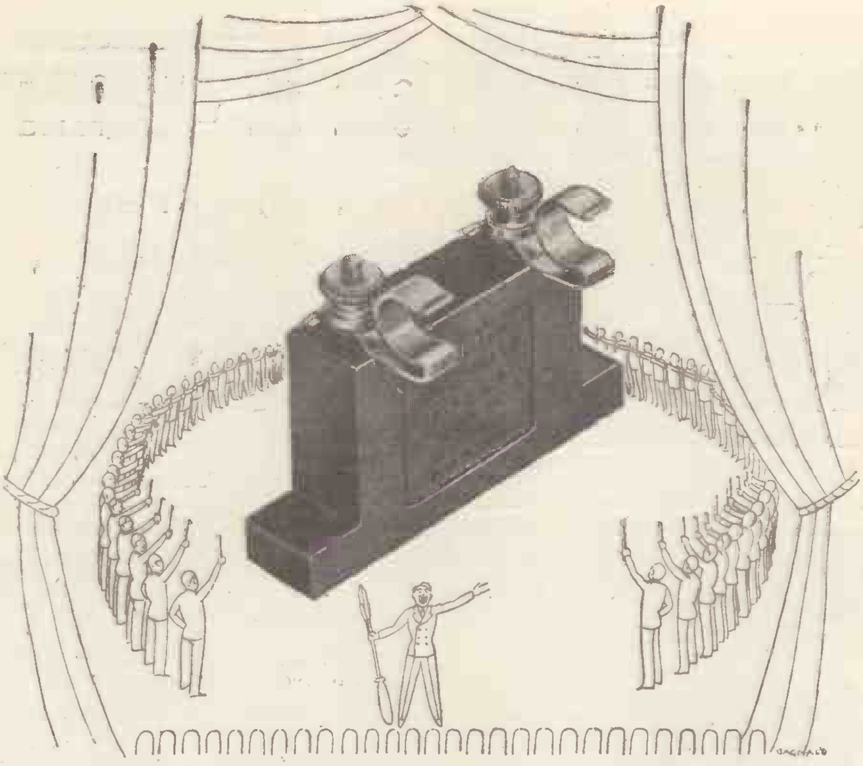
The
Government & Broadcasting
The Path of Progress
The
"SUPER-SCREEN" THREE
Jack Hylton & The B.B.C.
The Mystery of Room 40

Our cover photograph shows (left) Prof. Theremin playing his oscillating "musical box." A special article describing it appears in this issue.



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All Dubilier Products are fully described in the catalogue shown here. In addition there is a lot of information which you may find interesting. If your dealer has run out of copies we will forward you one free.

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DUBILIER DICTA

No. 5.

Many years ago there dwelt on the outskirts of a far-off city an honest merchant. Daily would he sit by the wayside offering for sale unto those entering the city small singing birds.

"Take this bird," he would say, "treat it with kindness, and it will make melody to gladden your city home."

* * *

Now it so happened that the fame of this honest merchant spread abroad throughout that land, for the exquisite melody of his singing birds was it not a joy unto all that heard? Moreover, as he charged a fair and reasonable price for his birds he waxed prosperous

* * *

Then there arose (as there usually does in such cases) a cunning merchant whose name was Haak. He made much study of the honest merchant's ways, and, being envious of his prosperity, he sought means whereby he might divert into his own coffers the shekels that fell to the lot of the honest one.

* * *

And he caught many sparrows of the city and did colour them to resemble the song birds. And he said that the Alchemists would give much to discover the secret of his dye. And he did take up his stand with his coloured birds farther down the highway, so those entering the city came to him first.

* * *

"Who'll buy? Who'll buy?" he piped from the wayside, "Are not my birds cheaper by far?" And many bought who, being deceived by the outward appearance, and attracted by the small cost, believed they were receiving true makers of melody at knock down prices.

* * *

And, as they passed on down the dusty road that led to the city, a wry smile played about the lips of the cunning merchant who was named Haak.

* * *

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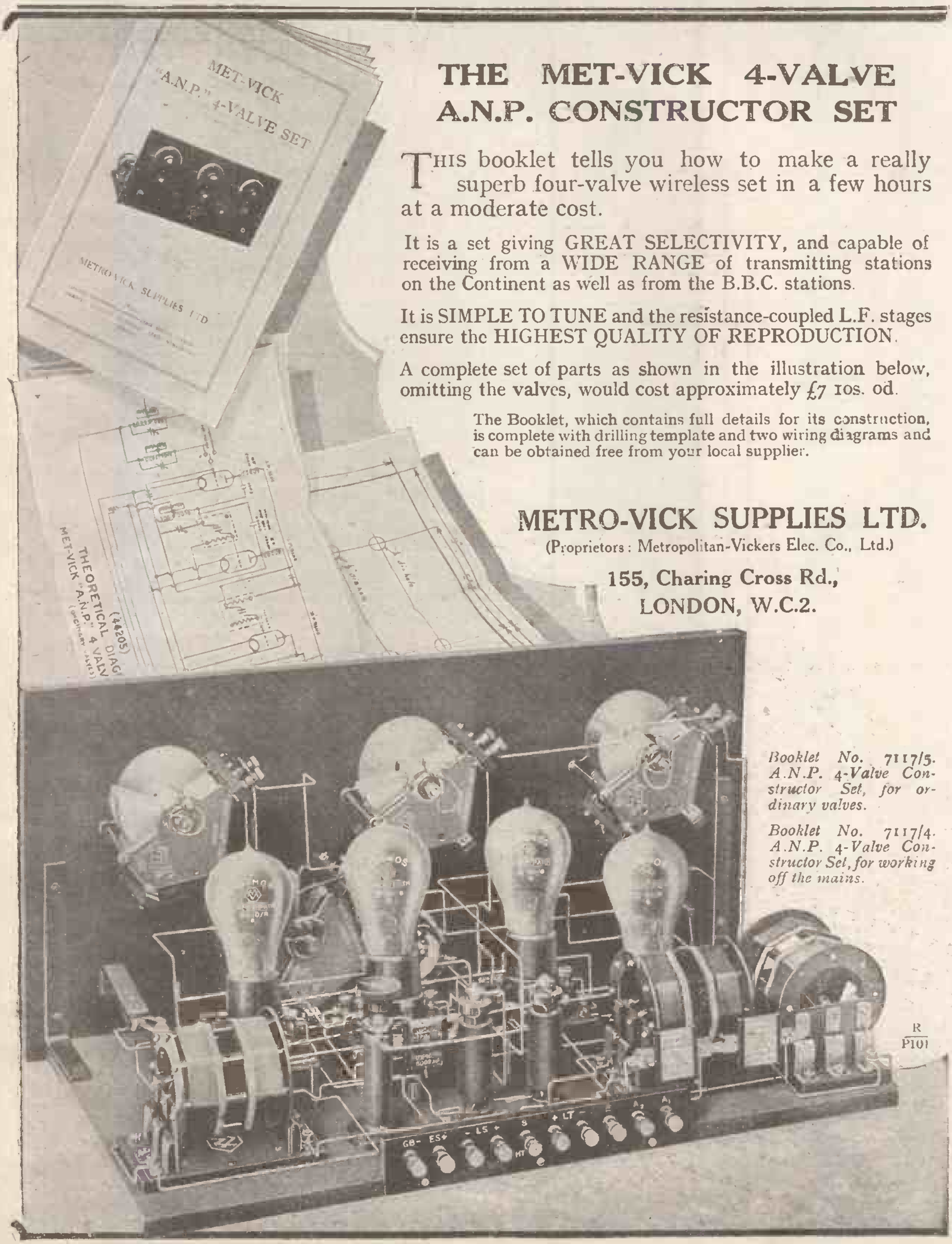
A Home-made Met-Vick Four



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It is SIMPLE TO TUNE and the resistance-coupled L.F. stages ensure the HIGHEST QUALITY OF REPRODUCTION.

A complete set of parts as shown in the illustration below, omitting the valves, would cost approximately £7 10s. 0d.

The Booklet, which contains full details for its construction, is complete with drilling template and two wiring diagrams and can be obtained free from your local supplier.

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Booklet No. 7117/5. A.N.P. 4-Valve Constructor Set, for ordinary valves.

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P101

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JUST think of it! Concerts from seven countries, one after the other, on a Set you have made yourself! That's what you'll get with the wonderful Cossor "Melody Maker"—the Set that has brought Radio to the masses. You need not know the first thing about Radio to be able to build this amazing Set. Thousands who know less than you do have already built it. It's as easy to build as Meccano. If you follow the simple instructions in the full-size chart, which your Dealer will supply you free, you can't go wrong. In an evening you'll build a Set that, at the turn of a dial, will bring you the broadcasting of Europe. There's no blue print to puzzle you. No soldering to thwart you. As easy as A. B. C.! Remember, too, that you'll save money—the Cossor "Melody Maker" will give you better performance than many factory-built Sets costing twice the price. Ask your Dealer for "How to build the Cossor 'Melody Maker'", or send a P.C. to A. C. Cossor Ltd., Highbury Grove, London, N.5.

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RADIO NOTES AND NEWS.

Conjuring by Radio—Short-Wave Stations—Sparks!—Our New Scientists—Broadcasts to Note—Do You Applaud?—A Last Word.

Another Milestone.

AT the last breath of the Old Year we salute the new, and tender to all readers our hearty wishes for a happy and prosperous 1928, with the luck evenly mixed, but not the weather—let that be strictly according to season. It's not been a bad old year, anyway. so let us pat him on the back before he expires.

A Retrospect.

NO, taking it in the lump, 1927 has been an outstanding year for radio, I think.

A year ago, to ordinary sight, there were no signs of direct reception of broadcasting from Australia; no transatlantic telephony, no Beam stations working, no 5 G B, no 5 S W, no influenza, no taxes—hullo! I've overshot the mark in my enthusiasm. But have the programmes improved? Yes? No? Don't ask *me*. Write and tell us what *you* think.

Vision.

AS to the coming year. in radio affairs I anticipate that it will be a "humdinger."

By this time next year you will have grown used to broadcasts relayed from the Continent, Canada, America, Australia and perhaps India and South Africa; you will be able to telephone by wireless to some of the Dominions; a new system of telegraphy will have been put into operation across the Atlantic, namely, facsimile picture-telegraphy under the Wright system, and as to wireless telegraphy in general there will have been constant expansion: (Listen to Old Moore!—Ed. "P.W."). And as for the prices of valves and sets, and as to television—well, I'm no prophet, as you see.

Conjuring by Radio.

I SEE that the B.B.C. is giving lessons in conjuring to children, parents being asked to leave the room during the broadcasts. I foresee ruined watches and top-hats by the score, besides escaped rabbits, and goldfish gasping on the carpet. But, bless us, who could teach conjuring to a small boy? It would puzzle Maskelyne and Cook to counterfeit the skill my small son shows in filling his pockets with ironmongery and oddments of every conceivable kind.

Radio Overdone.

FATHERS and "fans," take warning from the fate of little Eric Palmer, aged fifteen, son of a radio editor of Brooklyn, New York. This kid has undermined his health, made his mother a nervous wreck, had his apparatus smashed by his father and his licence suspended, all because of his addiction to radio. Writing to the Federal Radio Commission. his father said: "I believe the boy will die of under-nourishment and lack of sleep. I do not believe he has seen sunlight in three months." Some "fan"! Trying to get Rugby, I expect!

A section of the elaborate earthing system being installed at the new Air Ministry radio station at Mitcham.

Our Wireless Encyclopedia.

AERIAL: So called because it is situated underground or a foot above the ground, or wound round a small frame and placed on the table, or hidden behind the picture-rail, or not used at all. *Transformer:* Like a Sunday School, the transformer has a primary and a secondary and often makes a lot of noise. It often has an "outing," too—for the good of the primary or secondary. *High Tension:* State existing in society when broadcasting station breaks down and society is ignorant of the fact. More dial-twiddling done then than when society is trying to tune in Sydney, N.S.W.

Short-Wave Stations.

A FURTHER selection, recently compiled—S.S. Derbyshire, G L Y X, 37; Telegraph Administration, Oslo, LCHO, 33; Dakar, OCDA, 35; Rufisque, O C R U, 39; Sebastopol, R C T, 64; Leningrad, R D R L, 28·5; Karlskrona, S A A, 44; S.S. Massilia, S I C, 42, 51·5; Motorship Suecia, S G T, 42, 50; German aeroplane, X E K 4 A P, 42·5; Reno, Nevada, K D E K, 70, 55; Radio Club of Zurich, E H 9 X D, 85, 32; Bizerta, F U A, 42·5, 56, 73; Toulon, F U T, 36·5; Royal Air Force, Henlow. G F Y 76; Coltano, I C C, 18; Tripolis, I C K, 45; Norddeich, K A V. 36. 68.

Odds and Ends.

THE Chicago Federation of Labour is planning a chain of co-operative farmer-labour owned

(*Continued on next page*)

NOTES AND NEWS.

(Continued from previous page.)

and operated stations. The first of these is W C F L. The Radio Corporation of America has applied for two exclusive short wave-lengths for use in exchanging programmes with Britain.

More Short Wavers.

THE Mackay Radio Telegraph Company, a subsidiary of a large cable combine, controls a chain of short-wave telegraph stations, comprised of Guam, K T A, 18, 21·8, 22, 23·5, 36, 43·6, 44, 47; Honolulu, K N N, 17·2, 23, 23·7, 28, 34·4, 46, 47·4, 56; Midway Island, K T F, 21·6, 33·2, 43·2, 66·4: Palo Alto (Cal.) K N W, 16·7, 17, 24, 33·4, 34, 48, 51. All far, far away, and fair game for any man who thinks he is the snake's hips when it comes to manipulating a receiver.

Oh, Mong Jew!

AND what is the matter with fair France, really an A1 radio country, that her broadcasting system is in need of such drastic overhauling? There is more than a strong indication that they are to begin *de novo* with three national stations working in conjunction with eighteen district stations. Money seems to be at the bottom of their trouble, for I learn, too, that they contemplate raising the tax on receiving sets from one franc to ten; only a 900 per cent increase! Just as Britain is ripe for a 50 per cent cut in the licence fee! (Another "vision."—Ed. "P.W.").

Sparks!

THE Washington Conference agreed that by 1940 all spark sets shall have been removed from ships. That will be a boon indeed—to those who are now just beginning school. Apropos, the Post Office has recently emitted a self-satisfied toot because its new station at Mablethorpe, Lincs, is not to have a spark transmitter. For this we are grateful, in proportion to the amount of Morse interference which will thereby be prevented, but we still beg for an acceleration—in the right direction—of the purifying process. We don't *all* live in Lincs!

Our New Scientists.

IF the B.B.C. really wish to do some good work in the educational line I recommend them to organise lectures for the benefit of newspaper radio experts, some of whom need tuition in elementary physics before they will be qualified to mislead their readers amongst the tortuous paths of radio. I see that our friend who recently advised the public to wear rubber gloves (no, Archibald! not goggles) to avoid "hand-capacity" effects, has since told us that when we see 0·1 amps—why the plural?—on a valve it means that the valve consumes one-tenth of an amp. per hour.

Clear Thinking.

I HATE to contradict, but I hereby declare that no valve ever made can possibly consume amperes. Bless me! Does the dear fellow think they are made of petrol? You can no more consume an ampere than you can steam a ship at 5 knots per hour. I would not be thought over-nice, but there is so much loose thinking on these subjects, due to "experts," that it is well to pull up sometimes and get straight on our definitions. An ampere is a *rate*, not a definite *quantity*, such as a pint or ounce. Moreover, strictly speaking, you cannot consume a watt, which is also a *rate*. But I grow academic. Think it over.

What is Sound?

THOSE who like these little excursions into the realm of accurate science may cherish the memory of a flutter I had some weeks ago with a writer who stated that no one knows what sound is. I intended to recommend him to visit a boiler-factory, but forgot. Aha! here is a nice letter from A. N. (Oslo) who says he is inclined to agree with what our "scientist" wrote, and solemnly warns me that "it is wrong to state that sound *is* waves of air or of other substances." A Norwegian Quixote, forsooth! tilting at imaginary giants, for, of course, no one says or believes that. Sound is not a thing, it is only a *sensation*, like light and heat. To a stone-deaf man sound is truly non-existent; it can exist only for beings which can hear.

SHORT WAVES.

It is said that since the installation of wireless in hospitals, the average length of time of a patient's stay in hospital has decreased by one week.

Commenting on this, an unkind critic of the programmes said: "No wonder."—"News of the World."

* * *

A magistrate points out that the law entitles a man to swear in his own house.

Radio constructors, please note.

* * *

NOT THE ORIGINAL COST, BUT THE UPKEEP.

Radio Dealer: "Well, sir, how do you like your new radio?"

Amateur: "Not much."

Radio Dealer: "Why, what's the matter?"

Amateur: "Well, last night my wife and I were listening in to a sermon, and when they passed round the plate for the collection I forgot, and handed my wife a shilling."

* * *

". . . The broadcasting manager, when he chooses his company, will have a comparatively simple task. He need not trouble about height, length of eyelash or shape of nose."—"Time and Tide."

Length of tongue and wind capacity will no doubt be important qualifications.

* * *

TOOT! TOOT!

Billy: "Say, Ernie, I just got a radio set."

Ernest: "Is that so? What kind of a set is it?"

Billy: "I dunno; but I call it a railroad receiver."

Ernest: "Why is that?"

Billy: "Because it whistles at every station."—"Radio News."

* * *

The following is an extract from MSS. received for the Editor's consideration:

"One of the essential features of a low-loss condenser is to keep all di-electric materials out of the consecrated field . . ."

We hope this isn't a forecast of more religious talks over the radio.

* * *

It is said that wireless has added hundreds of words to the language. Some of them are quite printable.—"London Opinion."

* * *

Wireless Dealer: "Yes, this is a wonderful set—a child can manage it."

Dubious Dad: "H'm! That's what I don't like about it."—"Answers."

* * *

There was a young fan of Centralia
Who fished every night for Australia;
He got some good practice,
But, sad as the fact is,
His efforts so far are a falia.

Broadcasts to Note.

THOSE who like to rob their systems of sleep on the night of Dec. 31st—Jan. 1st, will enjoy the Watch-night service from York Minster, which is to be broadcast from 2 L O, the Daventry brothers and other stations. On Jan. 5th, 5 G B will relay from Birmingham a comic opera, "Hearts' Desire," by Mabel Constanduros. Our Mabel's name is sufficient guarantee that the goods are first-class. Oh, by the way, I missed mentioning "Memories of 1927," Manchester, New Year's Eve, and "Wireless Favourites of 1927," 5 G B, on the same date. Aberdeen comes out with a "Hogmanay" programme relayed to all Scottish stations on Dec. 31st. Perhaps Sir John Reith will oblige the Southron public with a definition of Hogmanay.

Do You Applaud?

CRYSTAL users and others who feel the desire to applaud B.B.C. items in ink, will be interested to learn that the maker of the "Russell Oscillating Detector" has adopted the suggestion, which has received some support in the Press, that something might be done to facilitate the expression by listeners of their appreciation of items broadcast. Mr. L. G. Russell is supplying his dealers with "Applause Cards," for distribution to any listener who cares to ask for them.

S.O.S. Unlimited.

THE excellent results obtained by the B.B.C.'s S.O.S. calls during the past year certainly justify the Corporation's action in approaching the Union Internationale de Radiophonie with a view to the repetition by Continental broadcasting stations of its future distress calls; no doubt a general interchange of S.O.S calls amongst European stations will be the outcome, the very beneficial outcome. I do not feel quite so happy about the expansion of the B.B.C's "charitable causes" activity. Already an advisory committee has been set up. Committees have killed more than one good cause; besides, I think the "charities" get a very fair show as things are.

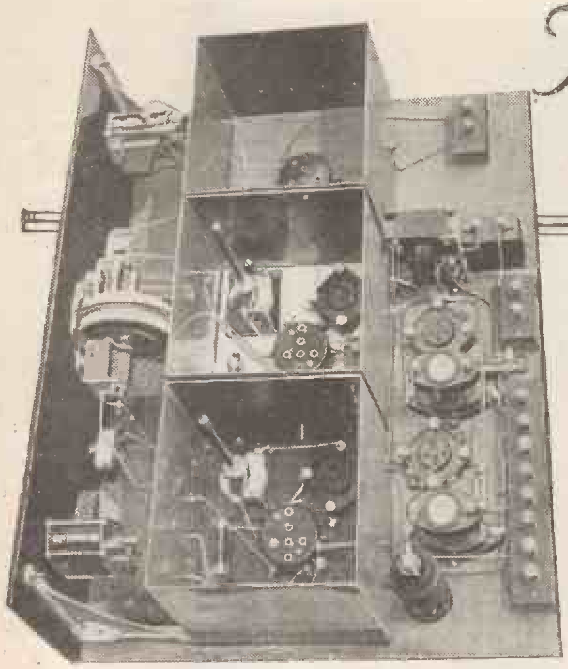
Beating the Air.

M. THEREMIN'S novel adaptation of "howling" to musical purposes seems to me to be more than a nine-days' scientific wonder, and I believe it will evolve into a new musical instrument which, maybe will have its Paganinis and/or Kreislers. According to the reports of ear-witnesses the sounds he produces have a charm for the ear, and may be made to imitate the *timbre* of other instruments. After all, I expect the first bow and fiddle seemed a fairly comical outfit to the casual observer, but now——

A Last Word.

AND now I come to my last 1927 note. It has been a great lark to collogue with all you chaps on almost every radio topic under the sun, and when I have spotted you reading "P.W." on the 'bus I have been tempted to make your acquaintance. But "Ariel" is just the spirit of "P.W." He is, officially, impersonal. As impersonal as Santa Claus. He means well; sometimes he pleases, and sometimes he earns a kick. That's life. Cheerio! To-morrow is a new day and a new year, but "Ariel" is for ever. Yours very faithfully,

ARIEL.



The PATH OF PROGRESS

Improvements in Radio Receivers.
New H.F. Valves of High Efficiency. H.T. Eliminators.
By SEXTON O'CONNOR.

THE past year has seen a noticeable change in the general attitude of the listener and home constructor towards the merits of high-frequency amplification. Not so very long ago it was the fashion to decry the use of high frequency, partly on the ground that it unduly complicated tuning control, and partly because it was considered that the H.F. stage did not pull its full weight, and that one got better value from an extra valve on the low-frequency side.

Such arguments no longer hold good. In the first place, of course, valves are cheaper both to buy and to run, and one extra stage is neither here nor there. In the second place, the general use of power valves has made more than two stages of low-frequency amplification an unnecessary luxury, so that the centre of gravity has naturally shifted towards the high-frequency side.

Selectivity and Stability.

Another point is that there is a wider appreciation of the advantages of using one or more stages of high frequency as a practical way of increasing selectivity. Each tuned valve interposed between the aerial and the detector acts as a filter to cut out interfering frequencies, and a number of such filters acting one after the other affords a very high degree of selectivity, quite apart from the natural increase in the range of reception.

Objection as regards difficulty in tuning control automatically disappears as soon as true stability is ensured. In this connection the neutrodyne method of stabilising or balancing the internal capacity of the electrodes has been supplemented by various alternative arrangements, both as regards the external circuits and also as regards the construction of the valves themselves.

As regards new circuit arrangements, the Loftin-White system of combined electromagnetic and electrostatic coupling is worthy of notice. Here successive high-frequency stages are linked together, partly by capacity coupling and partly by magnetic linkage, in such a way that inter-electrode reaction is automatically balanced out over a wide range of frequencies. At the same time the overall reactance of each amplifying stage is kept low, so that an efficient transfer of energy is ensured from one valve to the next.

This system overcomes the main objection to the original method of "neutralising" by means of a small condenser connected from a tapping in the output coil to the grid of the same valve. In such cases the "balance" cannot effectively be maintained over a wide range of tuning without making corresponding readjustments of the neutrodyning condenser. In the Loftin-White circuit, on the other hand, the balance is automatically preserved throughout.

The same advantage applies to the recently introduced "screened-grid" valve as used for high-frequency amplification. In this case a fourth electrode or shielding grid is inserted between the plate and the control grid, and is so constructed as to shield the latter from the electrostatic field of force emanating from the plate. As the two electrodes are in this manner effectively insulated from each other, no undesirable coupling effect can take place between them.

Another type of valve for securing an automatic "balancing out" of plate and grid coupling has been devised by Dr. Robinson, and is known as the Interdyne. Here, a double set of electrodes are mounted inside the same bulb and co-operate with a common filament to ensure stability.

Together with these improvements in circuit arrangements and valve design, inventors have been busy in devising new methods of linking together the necessary tuning adjustments into one central control. Prior to the introduction of automatically-balanced H.F. amplification, the ideal of "uni-control" was practically unattainable except in the case of sets comprising detector and L.F. stages only.

At the present time, however, the problem is comparatively simple. Given a perfectly stabilised H.F. system, a number of "ganged" or geared condensers can be operated from a common knob in such a way as to preserve correct synchronism between the various circuits concerned. Designers have gone even further than this by producing sets capable of being accurately tuned to as many as eight or ten different transmitting stations by the mere operation of two pairs of tumbler switches.

H.T. Eliminators.

Another outstanding feature of the year is the increasing popularity of eliminator and rectifier units designed for energising valve sets directly from the house-supply mains. At first sight it would appear as though the accumulator and the high-tension battery are both doomed to early extinction. At the same time, it is early days to make so definite a prophecy.

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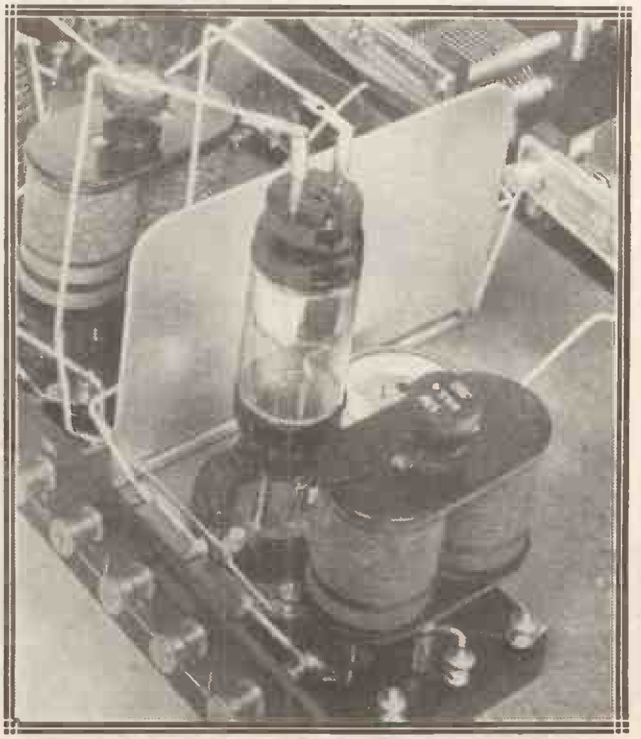


A screened-grid valve in use. The introduction of the screened-grid valve was one of the outstanding events of the year.

THE PATH OF PROGRESS.

(Continued from previous page.)

In the first place, mains units have not yet reached perfection for all purposes, particularly where high-frequency amplification is concerned, whilst on the other hand the resources of the makers of primary and secondary batteries are by no means exhausted. It may be that some genius will discover an entirely new means of storing up electricity by chemical means. Welsbach, it will be remembered, invented the incandescent mantle just in time to save the gas industry from extinction by electric lighting. In the same way, it is quite on the cards that we shall see a long, drawn-out battle between battery and eliminator in the radio industry.

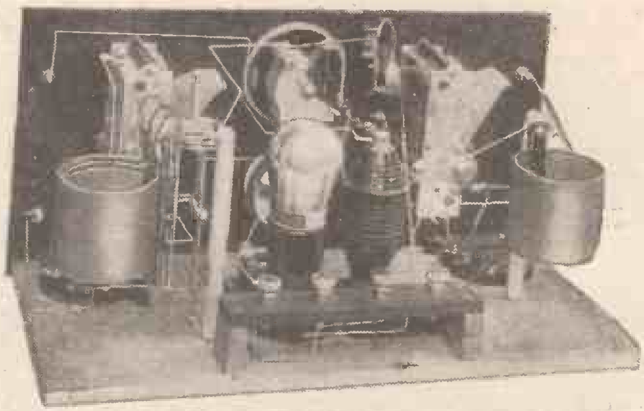
For the moment the need for an efficient supply of high-tension current is the more pressing. This is largely due to the increasing popularity of power valves requiring from 10 to 20 or more milliamps of current at a pressure of 100–200 volts. The capacity of the ordinary type of dry-cell battery to stand up to this demand is soon exhausted and constant renewal becomes expensive.

A.C. Units.

The wet-cell or accumulator type of high-tension battery offers a possible alternative, though here the initial outlay is high and the facilities for recharging are generally inconvenient unless an expensive home-charging unit is available.

For this reason the H.T. mains supply unit is most in demand. These devices fall into two classes according as they are designed to work off A.C. or D.C. mains. The former type is by far the more expensive to purchase, owing to the fact that special thermionic or other rectifying devices must be incorporated in the unit.

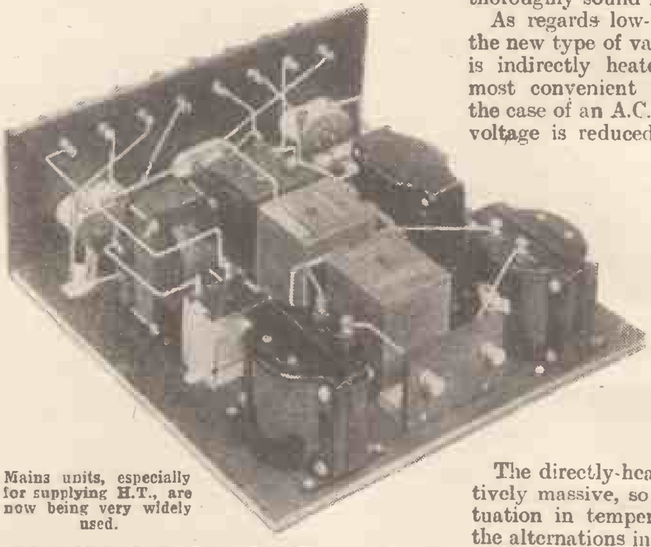
At the same time, A.C. units are, generally speaking, more satisfactory in operation than the less expensive D.C. type. This is partly due to the fact that A.C. rectifiers are isolated by means of a transformer from the mains proper, and are therefore cut off from intermittent disturbances caused by the switching in and out of other "loads," such as carpet-sweepers, electro-medical vibrators, etc., on the supply. It is also, however, due in part to the fact that the A.C. frequency note is a more or less well-defined and constant quantity, which the filter circuit can be designed to deal with and effectively subdue.



A Loftin-White one-valve set. The Loftin-White system was an interesting development of 1927.

With a D.C. unit, on the other hand, the receiving set is not cut off or isolated by a transformer coupling, but is only separated from the mains by the filter circuit. The latter can certainly be designed to cut out the "hum" caused by the commutator where this is a more or less steady note.

Unfortunately, however, commutator noise tends to vary with the care and supervision paid to the brushes by the engineers at the power house of any particular supply company. Also, brush noise varies as between one dynamo and another, so that a D.C. eliminator which will work satisfactorily in one locality will not always do so in another.



Mains units, especially for supplying H.T., are now being very widely used.

Finally, as previously mentioned, because of the direct connection through the filter with the general network of the supply service, the effect of outside loads and disturbances caused by other consumers on the same system cannot be effectively dealt with and may introduce undesirable noises into the set.

At the same time, the general standard of design in eliminator units, both of the A.C. and D.C. type, is rapidly improving. For loud-speaker work at short range, i.e. where H.F. amplification is not involved, the modern mains unit can be depended upon to give satisfactory results, and is a thoroughly sound investment.

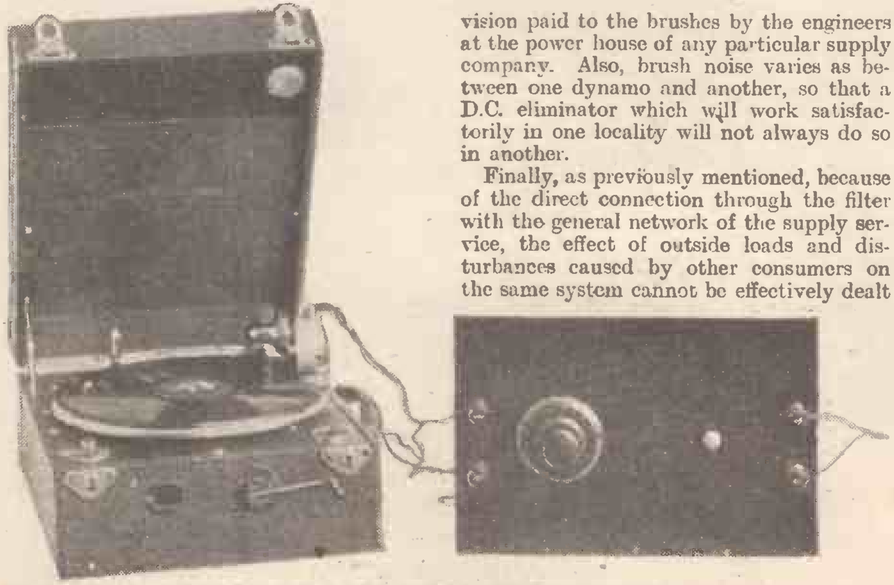
As regards low-tension from the mains, the new type of valve in which the filament is indirectly heated appears to offer the most convenient solution, particularly in the case of an A.C. supply. Here the mains voltage is reduced to a suitable value by means of a step-down transformer. No rectifier is used, but a comparatively heavy A.C. current is fed to a "false" cathode fitted inside the valve in close proximity to a "true" cathode of the dull-emitter type, which liberates a stream of electrons under the influence of the radiated heat.

The directly-heated filament is comparatively massive, so that no perceptible fluctuation in temperature occurs in spite of the alternations in the current supply. The true cathode is, therefore, fed with a steady supply of heat and maintains a uniform supply of electrons free from any trace of the A.C. frequency of the mains.

Gramophone "Pick-ups."

Amongst other general features of interest, it is to be observed that the horn loud speaker is tending to disappear in favour of the type of instrument using a cone or similar diaphragm of large area. The demand for high-quality reproduction is also tending to favour the moving-coil or electro-dynamic type of instrument in place of the older electro-magnetic action

An interesting side line development which promises to become very popular, especially for providing reliable dance music, is the use of the wireless set to amplify ordinary gramophone records. An inexpensive pick-up device is combined with the record needle, and translates its vibratory movements into corresponding electric voltages, which are then applied to a valve receiver and reproduced at great volume in the loud speaker.



The gramophone and the radio set came closer together in 1927 than ever before, owing to the popularising of the "pick-up."

MUSICAL "OSCILLATIONS"

A simple explanation of the thermionic "musical box" recently demonstrated in this country.

By

A SPECIAL CORRESPONDENT.

PROFESSOR LEON THEREMIN has recently given a series of successful demonstrations with a thermionic "music-maker," which is capable of producing a whole gamut of melodious notes, varying in quality from wood-wind to the richness of the 'cello.

In outward appearance the apparatus consists of a panel cabinet somewhat similar to a four- or five-valve receiver, to which a short rod "aerial" is attached at one side, whilst a small loop aerial projects from the other.

A tune is played simply by the movements of the performer's hand, to and fro, near the rod "aerial." At no time is the apparatus actually touched. The varying distance of the performer's hand from the rod changes the pitch of the emitted note, and so produces a tuneful sequence.

A "Mysterious" Effect.

Volume control is effected with equal facility by simply varying the distance between the performer's other hand and the small loop aerial. The effect is little short of miraculous. The music sinks or swells in sympathy with a gentle waving motion, similar to the baton of a chef d'orchestre.

The change of note from one pitch to another is not, however, perfectly clear cut. There is a slight slurring in which one hears a faint suspicion of all the intervening notes. The effect is, however, by no means unpleasing. It is, in fact, reminiscent of that obtained from the so-called "musical saw" beloved of recherché jazz-orchestras.

Another interesting feature is that no one note can be held absolutely constant for any length of time. No matter how steady the performer's hand may be, the slightest movement or wobble is reflected in a corresponding change in the pitch of the emitted tone.

The Secret.

The secret of the performance lies, of course, in the relative tuning control of two high-frequency circuits, and the corresponding changes in the pitch of the beat note as one set of oscillations heterodynes or "beats" with the other.

Most of our readers, turning back to their salad days at the art of tuning-in, will be familiar with the heterodyne howl caused when an oscillating set clashes with an incoming carrier-wave, and with the wailing rise and fall of that "howl" throughout the swing of the tuning condenser. The same thing is perhaps more noticeable when the other fellow swings his knob and oscillates. At all events the effect can still be observed nightly even in these more regenerate days.

Again, when searching for a distant station, on a receiver set on the threshold of oscillation, the effect of the slightest movement of hand near the tuning control will usually produce a similar illustration of the importance of small capacity effects. Still another illustration can be obtained by jabbing a metal pencil or pocket knife through the "empty" space inside a plug-in tuning coil, either when the set is gently oscillating or when it is just on the verge of self-oscillation.

In all these instances the source of the sound is the interaction of two high-frequency oscillations. If both oscillations are kept at the same frequency, the resultant note is of a steady pitch corresponding to the difference between the two primary frequencies. Of course, before such a "beat" note can be heard it must pass through the detector valve.

The rise and fall in tone is due to a change in capacity (or inductance) value in the local circuit, and to a consequent detuning, which, by altering the frequency of the local oscillations, varies the resultant "beat" frequency and, therefore, the pitch of the rectified note.

The Pitch Control.

In Professor Theremin's apparatus the pitch of the note is controlled by moving the hands to or from a short rod or aerial forming part of a tuned H.F circuit.

It must be borne in mind that the capacity value of the hand, or any other body in such circumstances, will depend upon the value and distribution of the electric field of force surrounding the charged control rod.

In the case of a simple charged "point," we know that the distribution of the electric field varies inversely as the square of the distance, whilst in the case of a charged rod it falls off approximately as the simple

(Continued on next page.)

AN "ETHER MUSIC" DEMONSTRATION.

Sir Henry Wood, Sir Oliver Lodge and Prof. Theremin at a recent demonstration in London. Prof. Theremin (right), was actually operating his novel instrument when this photograph was taken. By varying the distance between his left hand and the loop of wire he is able to vary very closely the volume of sound. The pitch is altered by his other hand by taking it nearer to or further from a metal rod which projects from the top of the instrument. Note the meters and controls on this latter.

SOME PRACTICAL HINTS.

Accumulator Vent Plugs—"Silver" Valves—Working Ebonite.

Accumulator Vent Plugs.

If you happen to lose one or more of the vent plugs of your accumulator, get it replaced as soon as possible. Dust must not be allowed to get into the acid of the accumulator, for dust is an impurity which will cause trouble. Until you are able to obtain a proper replacement a cork can be utilised to fill the gap, but a small hole should be made through the centre of the cork in order to allow the gas to escape from the interior of the accumulator while it is on charge and directly after. Do not use wood or a plug of paper, for such things rapidly succumb to acid. By the way, do not forget that the gas that escapes from an accumulator immediately after charging is of a highly explosive nature. Also the celluloid casing embodied in many batteries is very inflammable, so do not light your pipe or cigarette near an accumulator or place this close to the fire or any other flame.

"Silver" Valves.

The irregularity of the silver coating on the interior of the glass bulbs of some valves should not cause their owners to doubt the operating efficiencies of these accessories. After as much air has been extracted from the bulb of the valve by vacuum pumps, what is known as the "getter" is brought into operation in order to absorb the remaining particles. This "getter" generally takes the form of a small piece of magnesium oxide.

During the assembly of a valve a small portion of this chemical is placed on the plate. Subsequently, by means of high-frequency currents, the interior of the valve is brought to a great heat and the magnesium oxide evaporates and in so doing absorbs that remaining small quantity of air. As the valve cools down so does the resultant vapour settle on the interior of the glass bulb and form the familiar silver lining.

That this latter is present at all is something of a guarantee that the manufacturers have taken every possible precaution to exclude residue gases, and if it should be irregular it should not be taken as an indication that the process of manufacture has been likewise. Did an even coating of this silver lining prove essential to the successful operation of the valve, our manufacturers would soon see that this was obtained.

Working Ebonite.

You can use an ordinary rip-saw with not-too-coarse teeth for cutting down a large piece of ebonite, although the edge resulting will tend to be somewhat rough. For ordinary panel surfaces you should use a hacksaw having about twenty five teeth per inch. Metal working and not wood drills should be used for ebonite. Some constructors use only one small size of drill. With this, all the necessary holes can be drilled in the panel and enlarged to the desired sizes by means of a reamer.

Ebonite is not quite hard enough to take taps satisfactorily. Wood screws cannot be driven into ebonite. Unless braced by means of panel brackets, ebonite tends to warp. Warped ebonite panels can be straightened by dipping them in boiling water and then placing them between boards in which positions they should be held down by means of heavy weights.

Sir Robert Hadfield with Prof. Theremin examining the thermionic "music-maker."

MUSICAL "OSCILLATIONS."

(Continued from previous page.)

distance. For other shapes of charged surface, the surrounding field-intensity will lie somewhere between these two values.

In fact, it would be possible so to design the shape of the control aerial that a person accustomed to play the violin could secure the same tone emission from the musical oscillator by making exactly the same finger movements as if he were grasping his favourite instrument.

Be that as it may, the fact remains that Professor Theremin has shown us that a skilled operator can produce violin music merely by moving his hand in the appropriate fashion near the oscillator.

For the complete instrument in its most elementary form, at least two valve oscillators are necessary. The first oscillator is set and maintained at a constant frequency. The second comprises as part of its H.F. oscillatory circuit the control rod or aerial by means of which successive notes are produced.

In addition, there must be a detector—either a valve or a crystal—to rectify the beat note produced by the interaction of the first two.

This, of course, would only produce a thin reed-like note having no particular timbre. This quality can, however, be introduced by combining several harmonic frequencies. For example, by combining the output from the two elementary combinations described above the resultant complex note would be richer than the single note.

The Volume Control.

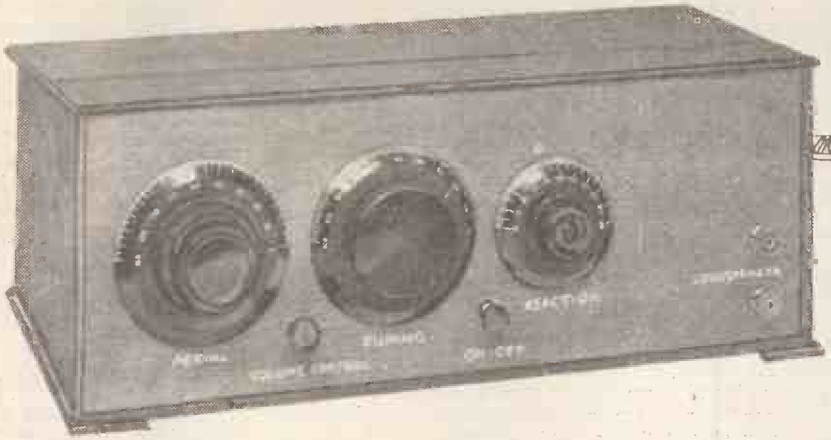
The same result can also be obtained in a less complicated fashion by "loading" each valve, either by imposing an excessive grid bias, or by introducing variable resistances or capacities into the tuned circuits, so that the simple sinusoidal currents from a "pure tuned" circuit are deformed into higher harmonics.

A method of volume control can be ingeniously contrived as follows. When the second hand of the performer approaches or recedes from the loop "control" previously mentioned, the H.F. circuit, i.e. the plate circuit, in which the loop is inserted is slightly detuned.

The normal value of the high-frequency current flowing in that circuit is therefore reduced. By connecting this circuit to the grid circuit, say, of the amplifying valve following the detector, the current fluctuations so set up can easily be made to vary the effective grid bias applied to the amplifier and thus control its output.

For instance, in the plate circuit containing the "hand control" capacity is inserted a high resistance which is also common to the grid-filament circuit of the amplifier valve. A reduction in plate current due to the detuning effect of the hand will cause the grid voltage on the amplifier to change accordingly, and so control or throttle the output to the loud speaker. In this way the volume of music swells or sinks in sympathy with the movements of the operator's hand.

THE "PROGRESSIVE" FOUR — Concluding Notes



This week the final constructional details are given and the incorporation of certain refinements detailed.

By G. V. DOWDING, Grad.I.E.E.
(Technical Editor.)

I SUPPOSE you have all noticed that up to now the "Progressive" has been lacking an "on-off" switch. I deliberately omitted this for the following reason. In my opinion the only reasonable place for a switch of this nature is on the front of the panel where it is readily accessible. Now, I could not place the switch in such a position right at the very beginning, so that its leads did not interfere with my step-by-step plan. Wherever I placed the switch on the panel, and whatever the route of its leads, these would tend to get in the way of the low-frequency additions and cause a slight confusion.

The leads could have been run under the panel, but this would have spoiled my wiring scheme, so, eventually, I decided to leave the business of this switch right to the very last. It can very easily be added, as I will show you, and the slight inconvenience occasioned by the delay in fitting it will, I am sure, be considerably outbalanced by the corresponding simplicity of the development of the receiver.

The "On-Off" Switch.

The switch itself can be of any make, providing it is of the simple on-off single-pole type and is suitable for panel mounting. I, personally, prefer the push-pull type such as is made by Messrs. Lissen. The switch should be mounted on the panel between the second and third variable condensers (from the aerial end of the set) as shown in the photograph of the complete set and the diagrams which accompany this article.

Lead No. 6 should be disconnected from the L.T. plus terminal and joined to one terminal of this switch. It is quite possible that this lead will not be found long enough to make its new connection, in which case another piece of wire will, of course, have to be used. Another new lead must then be connected between the L.T. plus terminal and the remaining terminal of the switch. This lead we will call No. 43.

This completes the little operation. Try to keep these leads well down on the baseboard. With a little ingenuity you will be able to tuck them well away so that they are quite neatly placed. Make absolutely certain that there is no risk of either of the leads in question touching any one of the other leads in the set even should anything be accidentally roughly handled, for it is possible that all your valves can be completely destroyed merely by one of these L.T. leads touching another lead or any of the components to which they are not joined.

Now the last operation is the introduction of a high-frequency stabilising device. Your particular set may be so stable that you do not feel that anything of this nature is necessary, nevertheless I would advise you to incorporate it in

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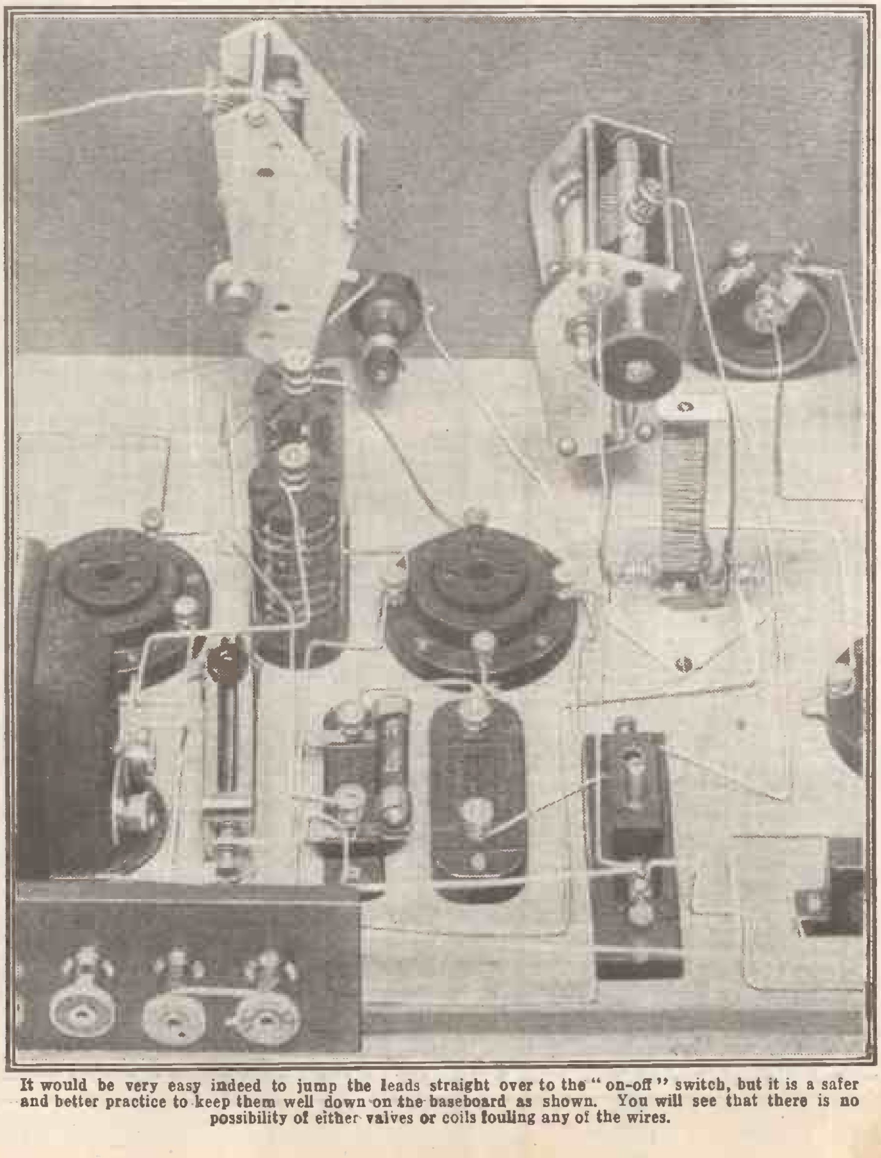

It would be very easy indeed to jump the leads straight over to the "on-off" switch, but it is a safer and better practice to keep them well down on the baseboard as shown. You will see that there is no possibility of either valves or coils fouling any of the wires.

THE "PROGRESSIVE" FOUR.

(Continued from previous page.)

your set, for it will prove extremely useful as a volume control. You will be able to adjust the strength of the reproduction to a nicety without upsetting any of the tuning controls or doing anything that is likely to introduce distortion—such as, for instance, reducing the H.T.

You will remember that tappings are provided on the intermediate tuning coil for providing various strengths of reaction coupling. Now it is possible that you find the set oscillates rather too readily with the minimum settings of both this and the reaction condenser adjustments when the aerial and high-frequency tuning circuits are brought into tune. The stabilising device will cure this and any other tendency for the set to be over lively.

An ordinary potentiometer is the device in question, although it is not used in the ordinary manner. In fact, it is not used as a potentiometer at all, but operates as a variable resistance in the grid circuit of the first valve.

Any good-make of potentiometer can be used—I used a C.E. Precision and found it quite satisfactory. It should be mounted on the panel between the first and second variable condensers as shown in the photographs. Only two of its connections will be required—one of the outer ones, which is connected to the end of the resistance wire winding, and that one which is joined to the moving contact of the device. The other terminal should be ignored.

Follow This Carefully.

The necessary alterations in the wiring are just a little more complicated than in the case of the on-off switch, so that I want you to follow me closely, although, of course, you have the wiring diagram to refer to and you can compare this with the one published last week if you should find anything that is not quite clear to you. I cannot help interposing the remark that here, if nowhere else, my wiring numbers are fully going to justify themselves!

First of all, you must disconnect lead No. 27 from the filament terminal of the first valve holder. This lead can be snipped down tidily so that it finishes its journey at the point where lead No. 28 joins it. Leads Nos. 27 and 28 now become in effect one lead which runs between the lower terminal of the first variable condenser and the coil holder.

Now two new leads altogether are required. The first, No. 44 on the diagram, should be joined to that filament terminal of the first valve holder vacated by lead No. 27. The other end of the lead should be connected to the centre terminal of the potentiometer.

The other new lead, which we will style No. 45, is a very short one and passes from the other point on the potentiometer to the lower terminal of the first variable condenser. Well, I hope you were able to follow me clearly. You will see exactly

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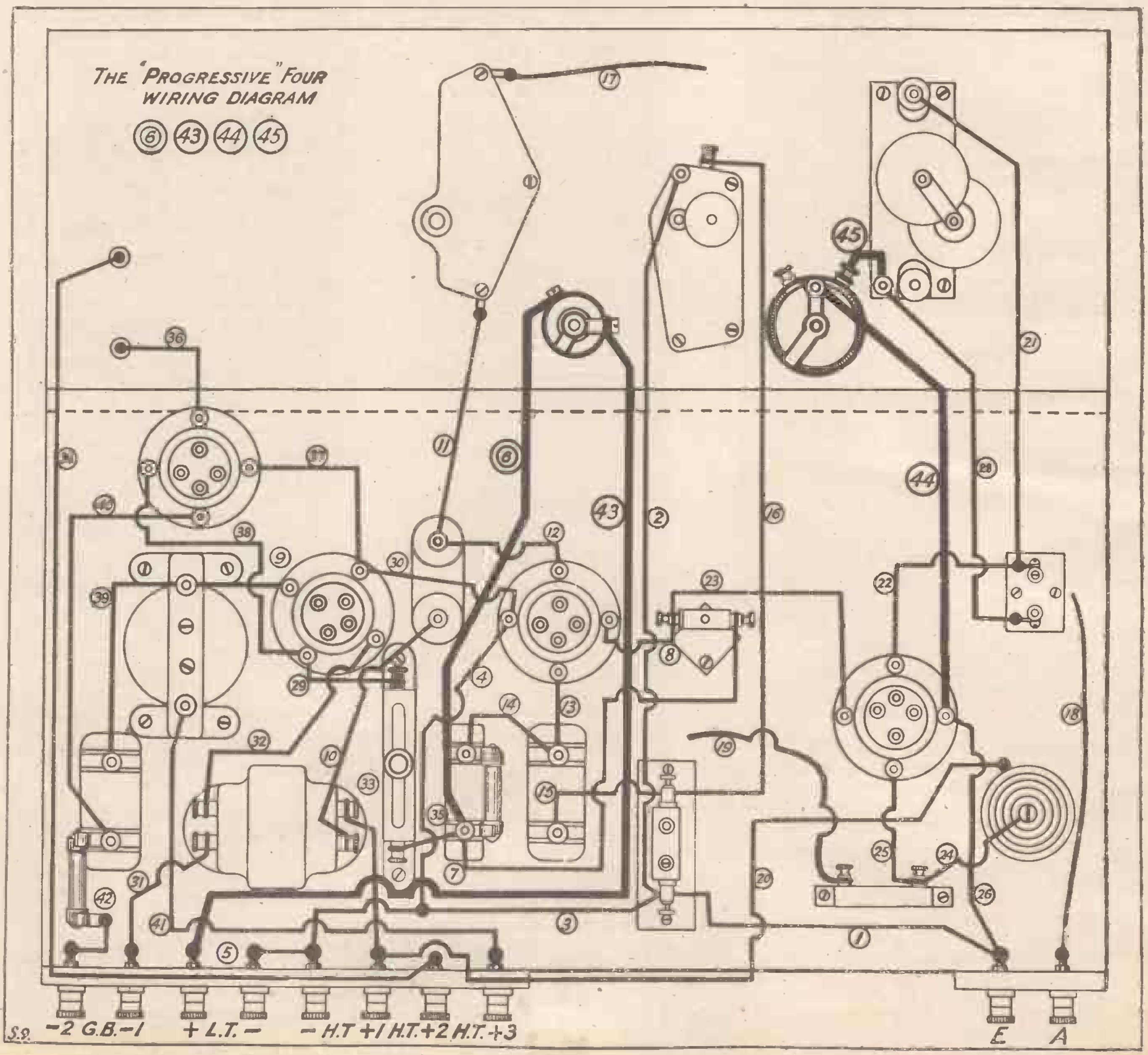


THE "PROGRESSIVE" FOUR.

(Continued from previous page.)

how this potentiometer takes its place in the circuit by referring to the revised theoretical diagram which I am giving this week.

Normally, the set should be worked with this potentiometer-resistance set so that it brings no resistance into the circuit, but if it is desired to reduce volume or to stabilise the set, reference can be made to the device.

The Volume Control.

It will be understood that this system of stabilising is known as a "losser" scheme. That means to say that stability is attained with its use only by introducing something that tends to cause a loss in general efficiency. If your "Progressive" proves to be very unstable without this component in use, I would advise you to try adjusting H.T. voltages and coil tappings, etc., before you attempt to use it. As I said before, it makes an almost ideal volume control and a slight tendency towards instability can be corrected by bringing a little of its available resistance into circuit, but please do not employ it to "blanket" a serious fault as otherwise you will be reducing the general sensitivity of the receiver.

Now by this time I hope you will have learnt everything about the manipulation of this set that there is to know, but let me remind you that you can cut out the high-frequency stage of amplification in a very easy manner. All that you have to do is to remove the valve from its holder, disconnect flexible lead No. 19 from the intermediate tuning coil and connect flexible lead No. 18 to this point instead of to the plug-in aerial coil. This last can also be removed, as it will not then be in use, although it will not affect results if it remains in its holder. The first variable condenser also becomes inoperative.

Fixed Condensers.

Now, some of you may have remarked upon the absence of fixed condensers in this set. I have cut these down to an absolute minimum, for a "dud" fixed condenser can cause an absolute failure in results. But now that you have, as I hope, the four valves all working properly and all doing their utmost, the refinement of one or two fixed condensers here and there can be safely tried.

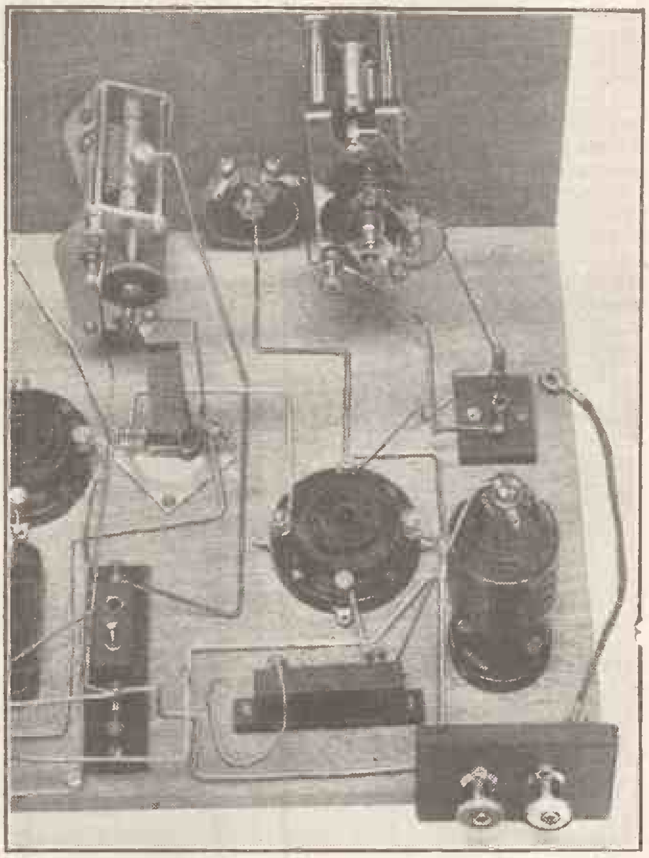
A ·005 mfd. fixed condenser can be fixed to the back of the front panel and connected across the loud-speaker terminals. This will help to give a final polishing touch to the tone. If you can find room for them somewhere, three 1 mfd. Mansbridge type fixed condensers can be connected between the H.T. points in the following manner. One terminal of each of these should be joined together and taken to the H.T. plus terminal. The other terminals of the fixed condensers should be connected one to each of the three H.T. plus terminals. The introduction of these large fixed condensers may have no effect whatever on results, but when the H.T. battery starts to run down, they sometimes assist in smoothing out any little irregularities that occur in the supply.

Some amateurs may accuse me of rank heresy, but I must admit that I seldom use these large condensers in my own set, and I cannot honestly say that I have often missed them! As with many other refinements they are "blankets" in the case of sets using battery H.T.'s. When an H.T. battery starts to generate irregular outputs then, in my opinion, it is time to change it. In the case of an H.T. mains unit, such are necessary and are invariably embodied in such an instrument.

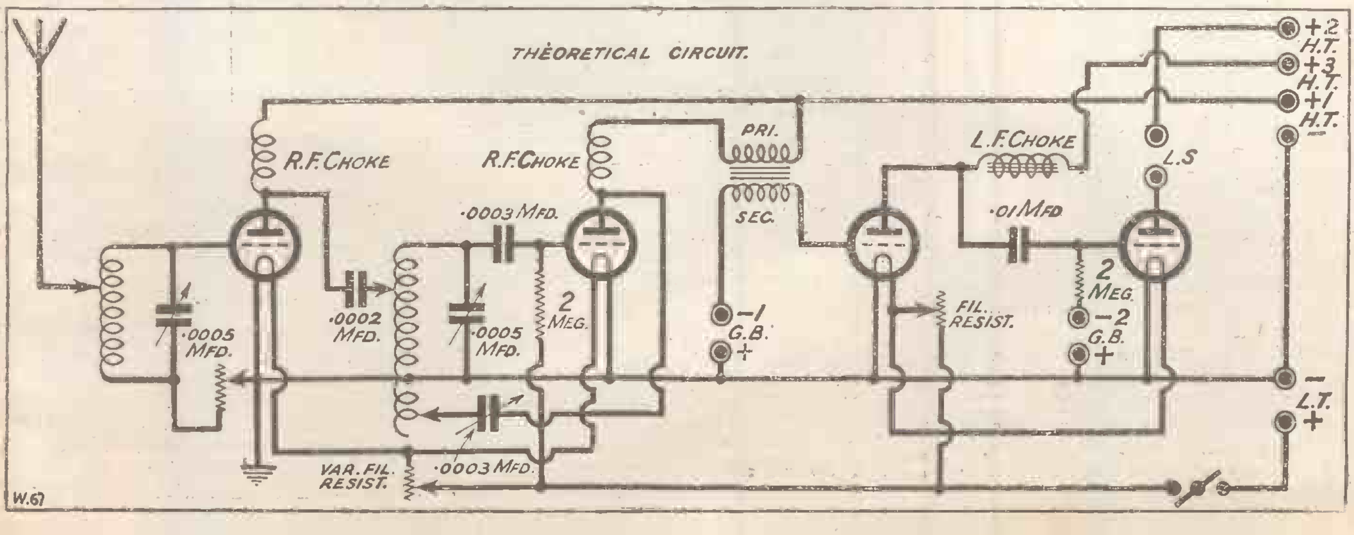
Well, in conclusion, I do hope that you have all enjoyed this series of "Progressive" articles as much as I have enjoyed preparing and writing them. And I hope that everyone of you who have built the set are genuinely satisfied with the results that you are or will be getting.

In Conclusion—

The actual construction of the original set occupied but a comparatively small part of the time I have devoted to it—the real work on my side was preparing the diagrams. But had these taken one hundred times as long to produce, my work would have been justified if the result had been what I hope it will be—the smoothing away of all the difficulties of the less experienced constructor.



Here you see the wiring of the volume control. The lead having four right-angle bends is numbered 44. Number 45 is the small lead connecting the volume control to the right-hand variable condenser.



TECHNICAL NOTES.

By Dr. J. H. T. ROBERTS, F.Inst.P.

PICTURE TRANSMISSION.

WEAF—EFFICIENT RADIATION—ELECTRON EMITTERS—RADIO BROADCAST RECORDED.

Picture Transmission.

THE well-known Cooley "Rayfoto" system is now being arranged for assembly by wireless constructors and experimenters in precisely the same manner as an ordinary receiving set.

In recent issues of "Radio Broadcast" (U.S.A.) full particulars are given for making up a picture-receiving apparatus from standard parts. Some of these, of course, are ordinary parts such as would be used in making up a conventional radio receiver, whilst others are parts supplied specially for the purpose.

The Cooley Rayfoto system is adapted only for the sending of "still" pictures. The received picture is produced upon a sheet of paper which is wrapped tightly around a rotating cylinder something after the style of the cylinder of a phonogaph machine. It takes about three minutes for a complete picture to be reproduced on the cylinder. Examples of untouched photographs transmitted by the Cooley system are shown in the journal mentioned, and are extremely good.

Broadcasting Pictures.

Pictures will be sent out by broadcasting stations using their regular assigned wavelengths, and no tuning changes are necessary in the ordinary receiver. For rotating the cylinder during reception, the motor of a gramophone or phonograph may be used, and special attachments are available to meet such a case.

It is anticipated that great interest will be aroused by this step forward in radio transmission and reception, and several U.S. manufacturers are already listing special parts to be used in connection with the system.

W E A F.

I mentioned some little time ago the new high-power transmitter at W E A F, but tests have so far been rather disappointing. Most New York listeners have depended upon station W E A F for their particular programme service; but, in spite of its 50 kw. the station gives weaker signals at many points—say, within 25 miles of New York—than were previously given by a much smaller station.

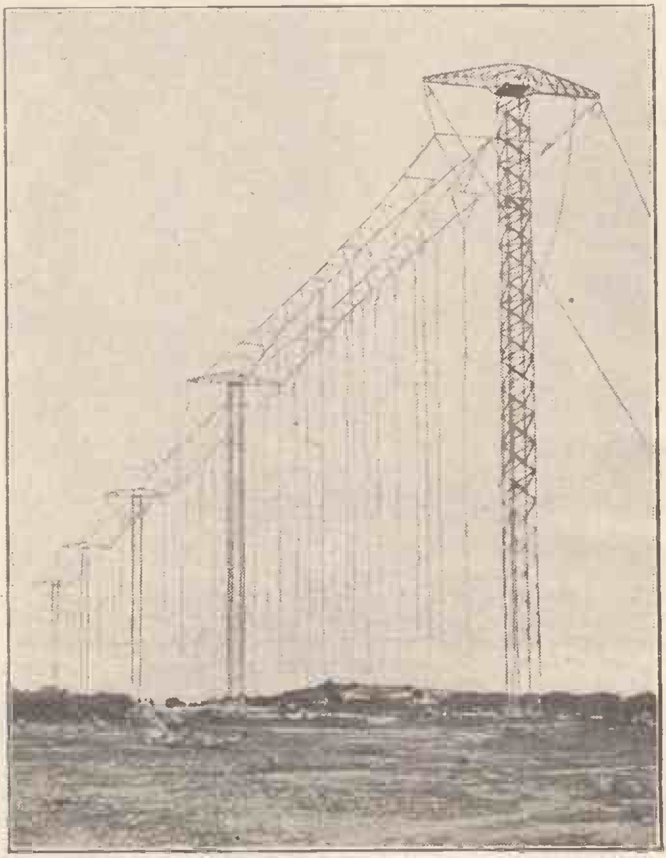
Experiments in Holland.

An official in the telegraph office at Haarlem, who is also a wireless amateur, has been granted a licence to erect a private distributing station for the purpose of making experiments with colour television. This is the first transmission licence in Holland to be issued to an amateur.

Efficient Radiation.

Dr. Coblentz, the well-known scientist of the United States Bureau of Standards, has lately given some curious facts with regard to the radiation produced by certain plants and insects. It is well-known that some insects (and fish) are able to produce a light glow, and the curious thing is that this is practically unaccompanied by the production of any heat.

Practically all our methods for the artificial production of light involve the use of some incandescent substance, and the amount of radiation which is produced within the visible range may be only, perhaps, one or two per cent of the total radiation, the remaining 98 per cent or 99 per cent being usually in the form of heat, and being, therefore, useless for the purpose in view. Thus, for every unit of energy which is converted into light, 98 to 99 units of energy are incidentally thrown away in the form of heat.



The masts carrying the receiving aerial and reflector system at the Milnerton Beam receiving station, five miles north-east of Cape Town. (*Marconi Co.*)

Fluorescent and phosphorescent substances are examples of light-producing materials in which the production of light is practically unaccompanied by the production of heat.

Electron Emitters.

The same arguments apply in regard to the filament of a wireless valve. Here, however, it is not *light* which we are desirous of producing, but *electronic emission*. The electronic emission represents only a very small percentage of the total energy consumed in the filament, by far the largest part of the filament energy being dissipated in the form of heat. By the use of much more efficient electronic emitters it has been possible to cut down the incidental heat production, and we have the modern so-called "dull" and "dark" emitters.

Investigations upon the mechanism of fluorescence and phosphorescence will probably help considerably towards the further improvement in the efficiency of electron emitters to function as cathodes in wireless valves.

Radio Broadcast Recorded.

For the first time outside Britain gramophone records of a radio programme are offered to the public—in U.S.A. This work has been carried out by the Victor Company, who have now placed on the market three double-sided records of the ceremonies of welcome to Colonel Lindberg, the famous Atlantic flyer. On these discs are recorded the voice of President Coolidge, the various announcements, and a short address by Colonel Lindberg, also his principal speech at the National Press Club. The cheers of the crowd, the applause which interrupts the speakers, the blare of the bands, and Lindberg's quiet voice are all faithfully reproduced.

The Victor Company arranged a direct wire from Washington to their studios, over which their recording apparatus received the same programme as each of the broadcast stations. The ceremonies were recorded on forty-six "surfaces," and finally edited down to six.

The U.S. radio journals offer congratulations to the Victor Company on this excellent step forward and they urge that similar permanent records should be made of various important broadcast events.

Short-Wave Experiments.

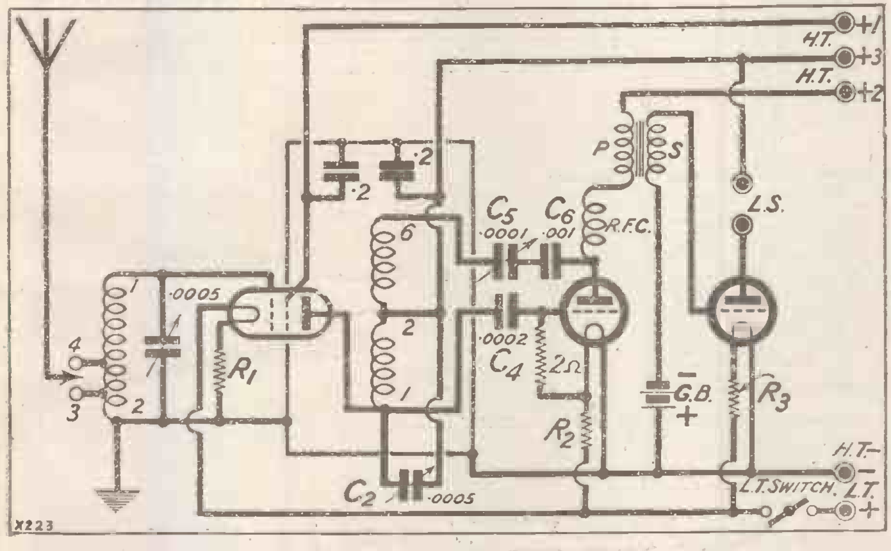
Readers interested in short-wave experiments will no doubt be familiar with the Igranic neutro-regenerative short-wave amplifier outfit which comprises two special high-frequency transformers and has two aluminium screens and special H.F. chokes. Efficient H.F. amplification on the short waves is thus claimed with this apparatus.

The "SUPER-SCREEN" THREE

Here is a "last word" three-valver which, although comparatively inexpensive to build, will give long-range loud-speaker results.

Designed and Described
By the "P.W." RESEARCH DEPT.

THE introduction of the screened grid valve has placed the designer of sensitive long-distance sets in a somewhat difficult position, since these valves bid fair to effect something like a revolution in the results which can be expected from a given number of H.F. stages, and in our methods of H.F. amplification, and it is being argued that they should be used in all receivers which make claim to be up to date; but, nevertheless, most people have stocks of the old three-electrode valves, components such as are only used in neutralised circuits, and so on, and many will not relish the idea of putting these on one side and purchasing fresh rather expensive valves and components, and readers in such a position have every right to expect that designs will continue to appear for their benefit for sets on the neutralised lines at present more or less standard for long-distance work.



A Useful Compromise.

It will evidently meet the needs of many home constructors if something in the nature of a compromise can be effected, whereby sets can be built using the new system of H.F. amplification, but using as many of the older types of components, methods of screening, and so on, as possible. In some special cases it may even be possible to show how to modify some of the older but well-screened sets, so as to use the new type of valve, and this gives a way out of the difficulty which will, no doubt, receive full attention. The receiver which forms the subject of this article is, in a sense, a combination of both these schemes, although it may be regarded as an entirely new design from the point of view of the man who wishes to make up a new set. Standard components have been used as far as possible, and the final result is a set of very high efficiency, since the desire to use existing components has not been allowed to interfere with the production of a set capable of giving really good results.

The set in its general construction very

(*Continued on next page.*)

LIST OF COMPONENTS.

1 Cabinet, 16 in.×8 in.×12 in. deep, complete with baseboard and brackets (Artcraft, Camco, Caxton, Pickett, Raymond, etc.).
1 Ebonite panel, 16 in. × 8 in. × ¼ in. (Any good branded material).
2 ·0005 mfd. variable condensers, with slow-motion drive or vernier dials (Those seen in the set are J.B. Any good make can be used, square law or S.L.F.).
1 ·0001 mfd. midget variable condenser (Igranic, Peto-Scott, or similar miniature type).
1 L.T. on-off switch (Igranic, L. & P., Lissen, Lotus, etc.).
1 H.F. choke, (Bowyer-Lowe, Burne-Jones, Lissen, McMichael, Ormond, R.I.—Varley, etc.).
1 L.F. transformer (Any good make, of about 3 to 1 ratio).
1 Standard screening box, with 6-pin base, and slot for screened valve holder (Any of the usual makes).
2 ·2 mfd. Mansbridge type condensers (Dubilier, Ferranti, G.E.C., Hydra, Lissen, Mullard, T.C.C., etc.).
1 Special valve holder for new screened valve (Colvern).
1 6-pin base for aerial coil (Burne-Jones, Colvern, Lewcos, Peto-Scott, etc.).
3 Baseboard filament rheostats (Any good make, in resistances to suit valves).
2 Anti-microphonic valve holders (Ashley, Benjamin, B.T.H., Burne-Jones, Bowyer-Lowe, Lotus, etc.).
1 ·001 mfd. fixed condenser Clarke, (Dubilier, Lissen, Mullard, T.C.C., etc.).
1 ·0002 mfd. fixed condenser (See above.).
1 2-meg. grid leak, complete with holder (Dubilier, Igranic, Lissen, Mullard, etc.).
1 Terminal board with 5 terminals.
4 Terminals for panel.
Quantity of No. 18 tinned copper wire, and one length of Sistoflex to fit wire.

Note.—It is not possible to give all the possible alternatives in the various makes of components, and only a few of those suitable can be mentioned. The names given are placed in alphabetical order.

THE "SUPER-SCREEN" THREE.

(Continued from previous page.)

much resembles the "Cube-Screen" Three, described in these pages some little while ago, and was actually made by taking the older receiver and modifying it in ways which we shall be considering in detail at a later point in this article.

The design can be regarded as a completely new receiver by those who wish to build a set on the new lines, whereas those who have built the "Cube-Screen" Three will be interested to see what modification would be needed to use one of the new shielded valves, and can keep this article at hand for use upon some future occasion when they feel they wish to possess a set of greater sensitivity and distance-getting powers, when they may feel inclined to alter their present instruments. The "Cube-Screen" Three, in its original form, was a

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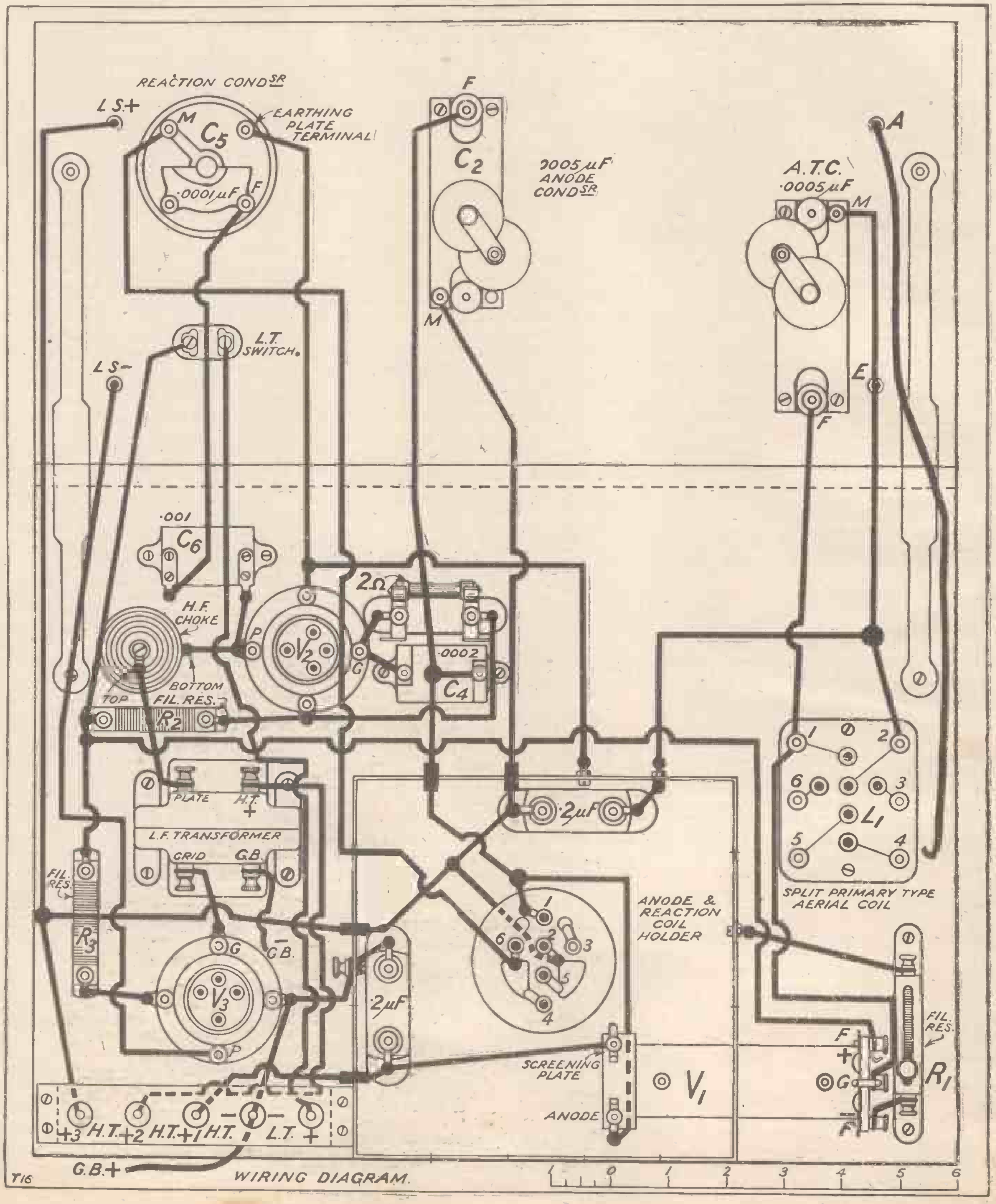
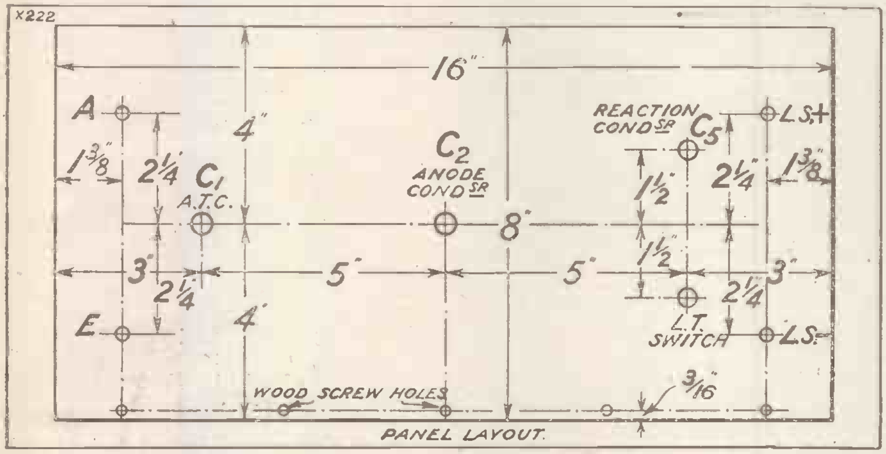


WIRING DIAGRAM.

THE "SUPER-SCREEN" THREE

(Continued from previous page.)

good example of a modern neutralised and well-screened receiver, and gave extremely pleasing results, with quite a number of distant stations on the loud speaker, and, of course, headphone signals from a very great number indeed. The present combination of one shielded valve in place of the normal three-electrode neutralised valve in the original set, followed by the same arrangement of detector with reaction and one transformer-coupled L.F. stage gives almost the impression that another stage of H.F. amplification has been added. With this set quite a range of foreign stations can be heard at good loud-speaker strength on anything like an efficient aerial, and the set as a whole is one which will satisfy the long-distance enthusiast for quite a considerable time to come. Hence there is no need to fear that you will soon become dissatisfied in favour of something still more powerful and up to date.



PANEL LAYOUT.

The Circuit.

In order that the reader may get a clear idea of the special arrangements used with the new type of valve, it may perhaps be as well at this point to go through the arrangement of the circuit and the set in detail, noting the departures from ordinary practice. The aerial and secondary circuits remain unaltered, consisting of the usual semi-aperiodic aerial scheme with a tuned secondary circuit, auto-coupling being used between them, and the actual component employed for the purpose being one of the standard six-pin aerial coils, as in so many of the present-day receivers. Across the tuned secondary circuit we find the grid and filament of the H.F. valve, and here we note the first alteration from the earlier types of H.F. sets, since it will be noted that the filament rheostat is connected in the negative filament lead, and that the return from the tuned grid circuit is taken to the battery side of the resistance, so that the voltage drop across it is utilised to impress a small negative bias upon the grid of the valve. This is sometimes done with normal three-electrode valves, but it appears to be of more decided benefit in the present case. It will be remembered that inside these special valves there is a fourth electrode which takes the form of a screening grid placed between the working grid and the anode, for the purpose, among others, of preventing what is called feed-back inside the valve. A lead is taken out from this extra electrode to a suitable tapping-point on the H.T. battery, usually at about 80 volts. This will be followed on the wiring diagram, and it will further be observed that a bypass condenser is provided straight from this electrode to the filament circuit, a capacity of ·2 mfd. being used in this set.

The simplest, and one of the most effective, ways of using the shielded valve is with a tuned anode circuit, and this arrangement is used in the "Super-Screen" Three. A good tuned anode circuit with this valve enables a very high degree of amplification to be obtained, without, of course, any difficulty from instability such as used to be experienced with the normal three-electrode valve. There is a certain amount of difficulty in obtaining an adequate degree of selectivity with tuned anode coupling, and for this reason and others, it is desirable that a coil of decidedly low H.F. resistance should be used in the anode circuit.

Accordingly, a special coil of reasonably high efficiency is required here, details of this being given at a later point in this article. Before leaving this point, however, I should like to explain that no attempt has been made to produce a coil of phenomenally low H.F. resistance, since the use of such inductances has the effect of producing a circuit of extremely low damping, which in turn tends to produce rather poor quality of reproduction, since the tuning becomes excessively sharp, and what are called the side bands of the telephony transmission tend to be cut off. It has been found in practice that quite a good effect can be obtained by the use of a suitable coil of solid wire of about No. 24 gauge on a former of the correct diameter, and this, of course, is extremely easy to wind.

Reaction of the usual Reinartz variety is provided upon the tuned anode, a special winding being added upon the same former for the purpose. The detector valve operates on the grid condenser and leak principle, and is followed by one stage of L.F. transformer-coupled amplification, this completing the circuit.

The Screening.

Turning now to the practical details of the construction and lay-out of the receiver, the first point to claim our attention is that of the screening and other devices adopted to ensure the stability of the valve. For the sake of simplicity and ease of construction it was decided to use one of the standard screening boxes in this set, although other methods of screening are also applicable to the shielded valve. The box is arranged exactly as in the original "Cube-Screen" Three receiver, the difference being that the shielded valve is arranged through a hole

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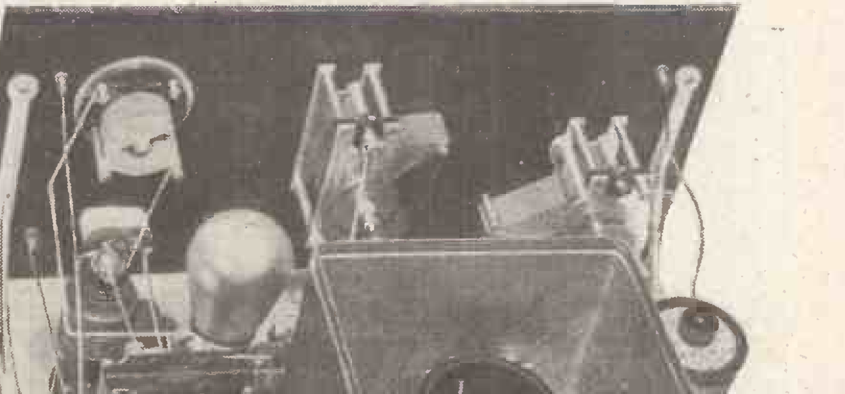
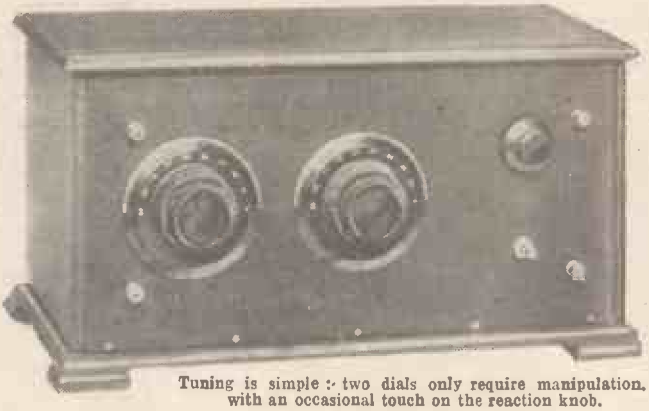


The general lay-out follows closely on the lines of the "Cube-Screen" Three, but the absence of neutralising makes it even simpler.

THE "SUPER-SCREEN" THREE.

(Continued from previous page.)

in the box so that the grid end projects outside, the plate end being inside. Inside the box will also be found the tuned-anode coil with its reaction winding, this being carried in one of the standard six-pin sockets for convenience. The only difficulty at this point of the constructional work concerns the cutting of the hole on the side of the box, and really the best advice that can be given here is that the whole box should be taken to a tinsmith, who will quickly cut the desired aperture for a very small charge with the aid of the valve and valve socket, from which he can get the exact dimensions of the piece to be cut out.



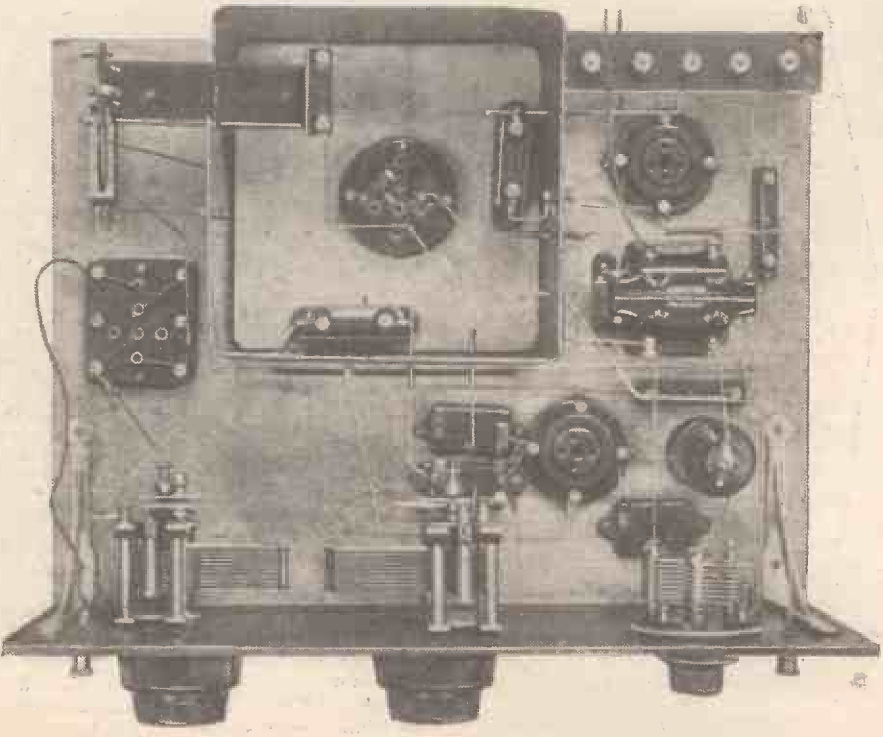
Tuning is simple :- two dials only require manipulation, with an occasional touch on the reaction knob.

The hole shown in the diagram is intended to fit the Colvern special socket for the shielded valve, since it was necessary to arrange to suit one particular type of socket, and the one in question is quite a convenient specimen. The mounting of this socket calls for just a little care, the first step being the drilling of two holes at suitable points below the lower edge of the hole cut out of the side of the box, these two small holes being for the two screws which hold the two parts of the valve holder together when it is mounted in position. One-half goes on each side of the "wall" of the screening box.

The details of the special tuned-anode coil are as follows. The former is one of the Collinson "Featherweight" type, with a diameter of approximately three inches. The tuned-anode winding consists of 60 turns of No. 24 D.C.C. wire, the lower end—that is to say, the end nearest the pins—being connected to pin No. 2, the finishing end being taken to pin No. 1. This winding should be arranged so that there is a space of about three-quarters of an inch unoccupied at the lower end of the former to leave room for the reaction winding which will be put on next.

Coil Details.

This consists of thirty turns of any available fine-gauge wire, such as 32 or 34 D.S.C., wound in the same direction as the No. 24-gauge coil; that is to say, as though it were a continuation of the other winding. The beginning of this reaction winding, that is to say the end nearest to the No. 24-gauge coil, is also joined to pin No. 2, this being a common point. The other end goes to pin No. 6, and when this last connection has been soldered the coil is finished and ready for use. A blank space should be left between the two windings of, say, an eighth of an inch, although this is not at all critical.



This plan view shows very clearly the method of mounting the screened valve socket in the side of the screening box.

The remainder of the constructional work is quite a straightforward job, and probably very little more need be said. The wiring can be done with any of the usual material, such as bare tinned copper wire, Glazite or other covered wire, one of the special easy soldering materials such as Junit, and so on, with sleeving where needed. (Further details next week.)

POINT-TO-POINT CONNECTIONS.

One filament socket of each valve holder to one side of each respective rheostat.

L.T. + terminal to one side of the L.T. switch.

Other side of switch to the remaining sides of the rheostats, R_2, R_3 and to the F + terminal on the valve holder V_1.

Remaining side of the rheostat R_1 to a screw through the copper screening box.

Terminal common to L.T. — and H.T. — to the remaining filament socket of V_3, to the G.B. + plug via a flexible lead and to the terminal on the copper screening box.

Earthing plate terminal on the reaction condenser to the remaining filament socket of V_2, and to a screw through the copper screening box.

Moving vanes of the ·0005 A.T.C. to the earth terminal on panel, to the No. 2 terminal on the aerial-coil holder and to a screw through the copper screening box.

Aerial terminal to the terminals Nos. 3 or 4 on the aerial-coil holder.

Fixed vanes of the ·0005 A.T.C. to the No. 1 terminal on the aerial-coil holder and to the grid terminal of V_1.

Anode terminal of V_1 to the No. 1 socket on the anode and reaction coil holder, to one side of the ·0002 fixed condenser C_4 and to the fixed vanes of the ·0005 anode condenser C_2.

Moving vanes of same condenser to one tag of the first ·2 mfd. Mansbridge condenser, to the No. 2 socket on the anode and reaction coil holder, to the H.T. + 3 terminal and to the L.S. + terminal on panel.

No. 6 socket on anode and reaction coil holder to the moving vanes of the ·0001 reaction condenser.

Fixed vanes of the reaction condenser to one tag of the ·001 fixed condenser, C_6.

Remaining side of C_6 to the plate of V_2, and to the bottom contact on the H.F. choke.

Remaining tag of the ·0002 fixed condenser C_4 to the grid of V_2, and to one side of the 2-meg. grid-leak holder. Other side of the grid-leak holder to the filament socket of V_2 which is joined to R_2.

Screening plate terminal on V_1 to one tag of the second ·2 mfd. Mansbridge condenser and to the H.T. + 1 terminal.

Remaining tags of the first and second ·2 mfd. Mansbridge condensers to screws through the copper screening box.

Top contact on the high-frequency choke to the "plate" terminal on the low-frequency transformer.

"H.T. +" terminal on transformer to the H.T. + 2 terminal.

"Grid" terminal to the grid of V_3.

"G.B." terminal to the G.B. — plug via a flexible lead.

Plate of V_3 to the L.S. — terminal on panel.

This completes the wiring.

Jack Hylton and the B.B.C

An interview with the famous dance band conductor.

By "ARIEL."

JACK HYLTON, and his all-British Band, has for some years been an outstanding attraction, wherever he has played; and in thus establishing himself at the very top of his profession he has proved that British artistes can render light music as well as, if not better than, any foreign importation. He is undoubtedly the most successful and most sought-after recorder of light music for gramophones in England to-day, and it is almost safe to say that there is hardly a possessor of a gramophone in the British Empire who has not some of his work.

A rather quiet and reserved person, he has an inborn sense of orchestration and rhythm, and when conducting his orchestra he develops an amazingly magnetic personality which grips his artistes and audience alike. He appears to concentrate the music of his band in himself, and to hand it on to you with a quiet smile.

Danger of Monopoly.

Jack Hylton is, unfortunately, not a frequent broadcaster, but is always ready to consider giving a performance when approached. He speaks most cordially of the courtesy he has always received from the B.B.C. officials, but this does not prevent him being a downright and straightforward critic of their policy.

"The very fact," he said, "of their having an absolute monopoly of broadcasting gives them a savour of a Civil Service Department, with its attendant bureaucracy and its consequent mediocrity and monotony in their programmes. The public are not getting fair treatment in return for their licensing fees. They are entitled to the very best talent that is available, and so long as the B.B.C. expects artistes to give their services for inadequate payment, they cannot have the best.

Weeks of Preparation.

"If my orchestra is to give a concert it means days, and possibly weeks, of preparation. I have a standard of perfection which, in justice to my public and myself, I must achieve. I must consider that my audience is not localised in a theatre or restaurant, but is distributed throughout the Kingdom, and that therefore my programme must be arranged to suit the larger public. It does not follow that what is pleasing to a London audience will necessarily go down in Aberdeen, Huddersfield or Belfast. When my programme has been settled, it may be necessary to re-orchestrate certain pieces for the microphone—this means rehearsals. If I am lucky, it may be a few hours; if not, days, before I am satisfied; then come general rehearsals, during which I have to devise a method—and each piece requires different treatment—of imparting to my unseen audience the true life and verve of whatsoever I am rendering. There can be no comparison between playing before an appreciative audience and the cold-blooded atmosphere of a studio. The very considerable labour and time spent in preparing a concert—and spent it must be—means longer hours for my colleagues and myself, interference with arrangements and possibly engagements. Unless I am adequately compensated for this I am not prepared to perform, because unless I can give of my best I would rather give nothing at all.

A recent photograph of Jack Hylton.

"The B.B.C. makes a great factor of the value of its publicity, and thrusts this forward when it comes to discussing terms. I, myself, am inclined to be sceptical with regard to the publicity value.

Overrated Publicity.

"It should realise in the first place that leading artistes are by no means dependent on broadcasting—even if it were perfect—which is by no means the case; in fact, in some cases the publicity is of very doubtful value, and, secondly, I consider it grossly unfair that it should wave this phantom flag of publicity in the faces of those artistes who are aspiring to the first flight, and by this means obtain their services at a figure which is incommensurate with the work they have done. The result is that, with a few notable exceptions, the B.B.C. programmes are, as I have said, mediocre and monotonous.

"Reverting to the doubtful value of broadcasting, a small incident which occurred some little time ago is a very apt illustration of what I mean. I was staying down in the country with some friends, and one evening we wished to listen to a certain performance which was being broadcast. We tuned in, and the whole thing was vague, uneven and disappointing; and the generally expressed opinion was that So-and-so was rotten. This I knew was not the case, and it transpired later that there was something wrong with the receiving set. It then struck me that this probably happens in dozens of instances daily, and that however perfect a performance I may give, and however perfectly it may be broadcast by the B.B.C., my entire work is wasted, and in some instances my reputation possibly injured by something over which I have no control. The publicity I obtain by my appearances in various centres, and by the sale of my gramophone records, is sure and certain, and the success and failure of it is entirely in my own hands.

Competition Required.

"In this there is no blame to be attached to the B.B.C., but the high value it places on its publicity powers must be modified by the present limitations of broadcasting.

"Do not imagine for a moment that I am in any way antagonistic to the B.B.C. —far from it; up to a point it has achieved wonders, but honest criticism doesn't harm anyone, and I would sincerely like to see some serious competition to my friends at Savoy Hill."

THE GOVERNMENT AND BROADCASTING.

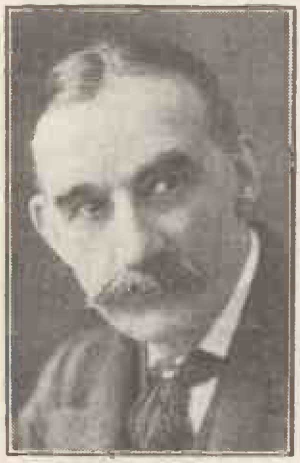
An impartial review of the situation to-day as compared with conditions two years ago.

By THE EDITOR.

NOW that the Broadcasting Corporation has been at work for a year, students of the Government control of public utilities are considering to what extent the B.B.C. is successful in the rôle of entertainer. These speculations are unfortunately based upon wrong premises. According to its constitution the new B.B.C. gives all the appearance of an ordinary State concern. But the officials at Savoy Hill have declined to accept this definition. In many respects—but not in all—their objections have been upheld in practice.

In theory, the disadvantages of the State control of broadcasting are a great deal more considerable than the advantages. Let us strike a balance. Taking the advantages first—there is the fundamental safeguard that the broadcasting service will not be used against organised society. Then its revenue is collected and guaranteed with the full authority of the State. There are also advantages of prestige and security of tenure. And, finally, there is the distinct advantage of centralised organisation.

Now for the other side of the picture. There is, first of all, the inevitable disadvantage of red tape, both in mind and in method. The very necessity of unruffled continuity makes a Government department a glorified robot.



Dr. Montague Rendall, who is a Governor of the B.B.C.

Then there is bound to be too much caution. The habit of "passed to you, please" slows down the machine, although it may reduce mistakes. Security of tenure breeds complacency. There is the further danger of partisan political control. Active political chiefs of Government departments may be tempted to use broadcasting to advance the cause of their party. But, of course, the most serious disadvantage is the absence of competition.

An Anachronism.

So much for the theory of the thing. If British broadcasting had really been conducted as a State concern the above criticisms would have applied to it *in toto*. Fortunately, however, the B.B.C. is, in its organisation and conduct, an absolute anachronism. Let us review to what extent, if at all, its activities are characterised as above.

Under the Company, the Government had nearly absolute powers through the Postmaster-General, but neither the Government of the day nor the Postmaster-General was disposed to take broadcasting seriously. It was tolerated with a mild benevolence and given the freedom which might be accorded to an eccentric guest at a country house-party.

The programme censorship was not continuous or consistent. Obstacles were constantly put in the way of any far-reaching developments; but, on the whole, the old B.B.C. managed to struggle along from day to day, establishing greater freedom and independence than was ever contemplated.

Too Much Red Tape.

It had been organised as a limited liability company, and it was administered according to current commercial practice under competitive conditions. There was thus no atmosphere of a Government department, and the minimum of red tape. During the General Strike the service was taken over as an instrument of Government propaganda.

But, apart from this, the four years of the old B.B.C. did not encounter any attempts at partisan political control, and even this one was generally accepted as national rather than partisan.

It may be said fairly, therefore, that British broadcasting, as long as it was administered by a limited liability company, suffered from none of the disadvantages normally associated with State control except the lack of competition.

So far so good! What of the Corporation? While it would be wrong to suggest that the Corporation has lost the vitality, directness, and business efficiency of the Company, there is no doubt that the past year has seen the intrusion of certain tendencies and habits of mind which are all too reminiscent of State concerns.

It is important to call attention to these now, so that they may be checked in the early stages. The first is red tape. Artistes, business men, and the general public have all noticed a growth of red tape methods at Savoy Hill. This is not yet chronic, but it wants watching.

The second dangerous tendency is caution combined with complacency. There is less dash and fire than there used to be. There is also too strong a sense of security of tenure. Under the Company new blood was introduced more frequently and more ruthlessly. The third cause for alarm is the amazing increase in the number and length of official announcements broadcast from Government departments before the news bulletin.

It is not known whether these are sought by the B.B.C.; as they are so dreadfully dull (much more dreadfully dull than the Children's Hour, Sir John!), it seems unlikely that they are sought. The presumption is, therefore, that they are imposed upon the B.B.C. through the powers conferred by the Royal Charter. If this is the case, urgent remedies are called for. I commend the subject to Parliament.

Another tendency open to objection and savouring of Government department methods is the growing disregard of public opinion. The attitude of Savoy Hill is much less accommodating than it was. Sir John Reith, in his now famous speech at Manchester, said that a policy of giving the public what it wants was quite wrong. Apparently the B.B.C. does not worry any longer about what the public wants. The idea is to give the public what it thinks is good for it; or at least that is the only reasonable interpretation that can be given to utterances of the kind mentioned.

Firmness and decisiveness are, of course, necessary. But dictatorial prerogatives cannot be associated for long with successful broadcasting.

Sir J. Gordon Nairne (another of the B.B.C. Governors).

To sum up, the B.B.C. is still far from being a Government department. Its system has much more in common with commercial practice than with State control. But, the farther we get away from the days of the Broadcasting Company, the more we observe the growth of tendencies—towards Government department methods. It may be that these tendencies are inevitable.

If they are, and if no effective move is made to check them, then the doom of British broadcasting is sealed. But I do not believe that any such thing is in store for the B.B.C. provided Sir John Reith remains at the helm in unhampered authority. If the present Director-General will desist from declaring his indifference to public opinion, and turn himself afresh to restoring the wonderful elasticity and efficiency of his organisation under the Company, we need not fear any debacle.

Danger of Monopoly.

Monopoly is always a bad thing. Every monopoly in public utilities should always be considered wrong in whatever it does, until overwhelming evidence to the contrary can be adduced. It follows that the very best thing that can happen to the B.B.C. is continuous, intelligent, trenchant, penetrating criticism. The almost complete absence of criticism of this kind makes the achievements of the B.B.C. all the more wonderful. But, for the future, we cannot afford to take risks. The course of time will involve changes in personnel. Those who come after will not have the fire and the energy of the pioneers. They will need more "ginger."

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BROADCAST NOTES

FROM OUR BROADCASTING CORRESPONDENTS.

The London Station—West Country Broadcasts—Two Interesting Plays—From 5 G B—Cardiff Station Items—Special Newcastle Programme—A Radio Pantomime—A "Schubert" Programme—Choral Works

The London Station.

THE London programme between 7.45 and 9 p.m. on Saturday, January 14th, will consist of a concert relayed from the Kingsway Hall. It will include items for a military band combined with the organ, choral music and songs by popular artistes, some of whom have not yet been heard by listeners.

West Country Broadcasts.

The Rt. Rev. J. H. B. Masterman, Bishop of Plymouth, is to give the address at a special service in the Plymouth Guildhall on Sunday evening, January 1st. His remarks will take the form of a New Year's message, and arrangements have been made to broadcast the service from the local station. On the following evening West Country listeners will have an opportunity of hearing the first broadcast by George Chinn, the well-known Cornish entertainer, who specialises in farmyard imitations.

Another interesting forthcoming programme from the same station is a concert by vaudeville artistes at 9.35 p.m. on Friday, January 6th, when in addition to selections by the Station Orchestra there will be items by Alma Vane (soprano), Franklyn Gilmore, and Ray Vincent and his Trio, who will be visiting the Plymouth Studio for the first time.

Two Interesting Plays.

Two interesting plays have been arranged for Liverpool listeners on Thursday, January 12th, in which the Liverpool Playhouse Company will be assisting the local Radio Players. The first is "Trifles," in which Marjorie Fielding will appear as "Mrs. Hale," and the second "Bal Masque," a light-hearted fantasy in one act by Oliphant Down, when the part of "A White Pierrot" will be taken by William Armstrong.

From 5 G B.

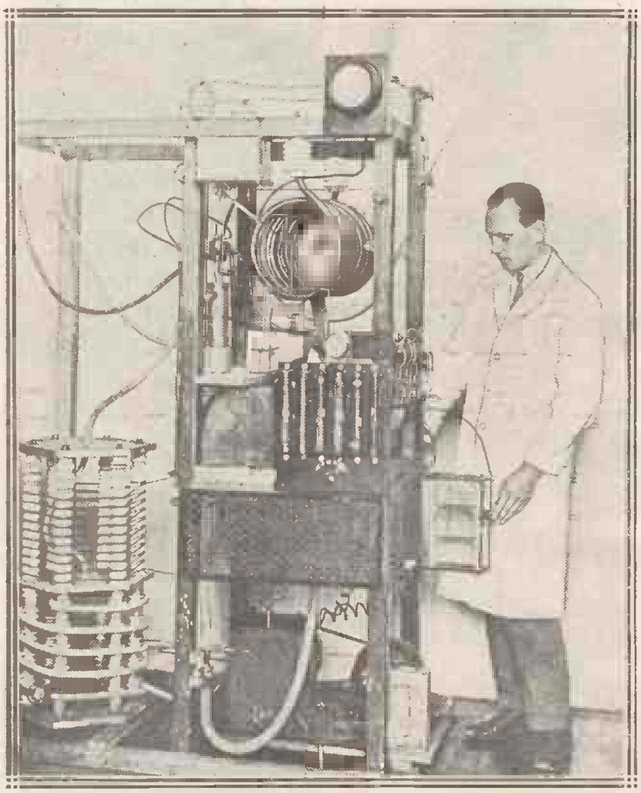
Henry Purcell, composer of many operas, suites and songs, is probably best known for his opera "Dido and Aeneas," which is to be broadcast by the Daventry Experimental Station on Sunday evening, January 1st. It is one of the finest English operatic works, and previous transmissions of "Dido and Aeneas" have been greatly enjoyed by listeners.

In fact, there seems to be no doubt that this composer of such charming and graceful music is beginning to receive the appreciation he deserves, and that the absurd ideas which used to exist about Purcell, among others that he imitated Handel—who, by the way, was only ten when the English composer died—are being dispelled.

The principal artistes in this transmission are Miranda Sugden, Emilie Waldron, James Howell and Geoffrey Dams. The Birmingham Studio Orchestra will be under the conductorship of Mr. Joseph Lewis. The religious service on the same day, conducted by the Bishop of Birmingham, the Right Rev. Ernest William Barnes, is to be relayed from the Birmingham Cathedral. Immediately before the service the bells of the cathedral will be heard by listeners.

Cardiff Station Items.

"The Spectre's Bride," a cantata for soli, chorus and orchestra by Dvorak, is to be broadcast by the Cardiff Station on Sunday, January 1st. The artistes taking part are Miriam Licette, Joseph Farrington and Tom Pickering. Earlier the same day a New Year's Day address, which was first delivered in Llandaff Cathedral in 1880, will be read under the title of "An Old Message for the New Year."



M. Belin, the French scientist, experimenting with a short-wave transmitter, with which he employs a water-cooled demountable valve.

On the following day Kenneth Ellis, Yvette, Stainless Stephen, and Sidney Evans will give a gay New Year's revue called "First Footing." This old custom has caused much serious excitement and fun in the past, and listeners on this occasion will certainly not find the programme lacking in amusement.

Special Newcastle Programme.

"Glimpses of the Past"—a series of special programmes, broadcast by the Newcastle Station, each of which deals with an episode in the history of Newcastle and the surrounding district—have met with so much interest and appreciation that the B.B.C. intends to carry them on until a complete survey has been made of the local history right down to the present day. The next, and sixth episode, which, like all the other programmes in this series, will be arranged by Col. G. R. B. Spain, C.M.G., in collaboration with Mr. Thomas Haxon, is to be given on Friday, January 6th, and deals with the Siege of Newcastle in 1644.

It will be recalled that this event took place during the wars between the Royalist and Cromwellian parties, when Newcastle was first occupied by the Scottish Covenanters and then garrisoned by the King's supporters, and it was while the city was in the occupation of the latter forces that the Scots, after a struggle lasting for about three months, entered and sacked it.

A Radio Pantomime.

Belfast Station is to broadcast "Our Pantomime," the lyrics of which are by Edward Teschemacher, and music by Herbert Oliver, on Monday, January 2nd. Later there will be popular items from musical comedies, the artistes being Janie Martin and Hugo Thompson, and the orchestra will play selections from old-time waltzes.

A "Schubert" Programme.

A "Schubert" Programme is to be broadcast on Tuesday, January 3rd, by the Daventry Experimental Station. The programme includes "The Erl King" and other well-known items sung by Joseph Farrington (baritone), and the "Unfinished Symphony," the "Overture to Rosamunde" and the "Marche Militaire" played by the Orchestra.

Choral Works.

Two short choral works—Debussy's setting to Rossetti's poem, "The Blessed Damozel," and "The Blest Pair of Sirens" by Parry—will be given in the Manchester Studio during the afternoon programme on New Year's Day.

A Repeat Performance.

Winifred Small and Maurice Cole's interpretation of "The Kreutzer Sonata," by Beethoven, proved so popular with Manchester listeners when it was broadcast some time ago that a repeat performance is to be given on Friday, January 4th. This Sonata, while giving full scope for masterly technique, taxes to the utmost the artistes interpretative abilities, and those who heard the last performance will look forward to their next broadcast.

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THE MYSTERY OF "ROOM 40."

A WELL-KEPT WIRELESS SECRET OF THE WAR.

BY A CORRESPONDENT.

FROM time to time secrets, sometimes big, sometimes little, about the conduct of the war and its many and varied phases are, so to speak, "let out of the bag," and cause a nine days' wonder. Many secrets have been explained away since Armistice Day, but probably one of the most interesting was revealed by Sir Alfred Ewing, the Principal of Edinburgh University, when he gave a lecture for the Philosophical Institute, Edinburgh, some days ago.

Sensitive Valve Receivers.

Sir Alfred, in fact, revealed the secret of Room 40 at the Admiralty. The "Secret of Room 40" sounds very much like the title of a shilling shocker, but, as a matter of fact, Room 40 at the Admiralty was where German wireless messages were deciphered. Sir Alfred was appointed by the Admiralty to undertake the task of collating and translating enemy ciphers. This job, by no means an easy one, was given him by the Director of Naval Intelligence, for when war broke out it seems there was no organised system for collecting intercepted wireless messages or any real method in force for deciphering them. However, Sir Alfred got busy and his department was the beginning of what grew to be a most vital factor in the conduct of the war.

The technical side was, of course, left to technical experts, and among them may be mentioned Captain Round, whose direction-finding stations and super-sensitive listening posts enabled Admiralty listeners to pick up buzzer signals which the German Navy sent out from time to time. In fact, while the German Navy was bottled up in Kiel ships used to communicate with each other by buzzer signals.

Buzzer signals, as the writer well remembers, were often a nuisance. When in convoy, for example, ships wishing to communicate with the Commodore's ship did not use the main wireless transmitting set, but just an ordinary buzzer connected to the aerial, untuned, and operating from an accumulator with power of about four to eight volts. These signals were just sufficient to enable communication over a distance of a few hundred yards, i.e. as regards normal reception.

Valuable Warnings.

But Captain Round's super-listening valve receivers were such that these extremely weak signals could be picked up at the various listening posts established by the British Admiralty along the north-east and northern coasts, and there as many as two thousand messages a day were intercepted and sent along to Sir Alfred Ewing at the Admiralty and to his staff of cipher experts in Room 40.

In this way it was possible for the British Admiralty to determine the day before the battle of the Dogger Bank what German ships were coming out and also at what time and where they were going.

As my readers can imagine, this information was of vital importance and enabled the British Admiralty to meet the enemy more than ready. During the action of the Dogger Bank the Admiralty experts deciphered every signal sent out by the enemy ships, and consequently could follow the battle in all its phases from start to finish.

The same with the Battle of Jutland. In fact, the Battle of Jutland was actually brought about because of the Germans using the buzzer signalling apparatus. Orders were overheard by the various Admiralty stations and, when deciphered at Whitehall, proved of such value that the Admiralty knew the German fleet was coming out into the open at last.

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Room 40 was only referred to as Room 40, and the greatest secrecy was observed about the work done there, for, as can be guessed, the slightest knowledge of what was going on in Room 40, or the slightest clue given to the Germans that we were able to translate and understand their code messages would have been spoiling a very good thing. Room 40 was a great secret and remained so right until the end of the war.

From time to time the British Admiralty had extraordinary good luck in capturing in one way and another various German code books; but the Germans were wily and from time to time they also changed their code.

In fact, in 1916 they had the habit of changing the key of the principal naval code signal at twelve o'clock, but so expert had the deciphering staff at Room 40 become that these changes in no way interfered with the elucidation of the messages.

Messages from Submarines.

According to Sir Alfred, the Zeppelins were very "talkative" by wireless, especially on their way home when they used to chat in code about their exploits. The same with submarines, and in May, 1915, wireless messages from the Submarine U20 were picked up and, translated, were found to be a glorified account of the sinking of the Lusitania.

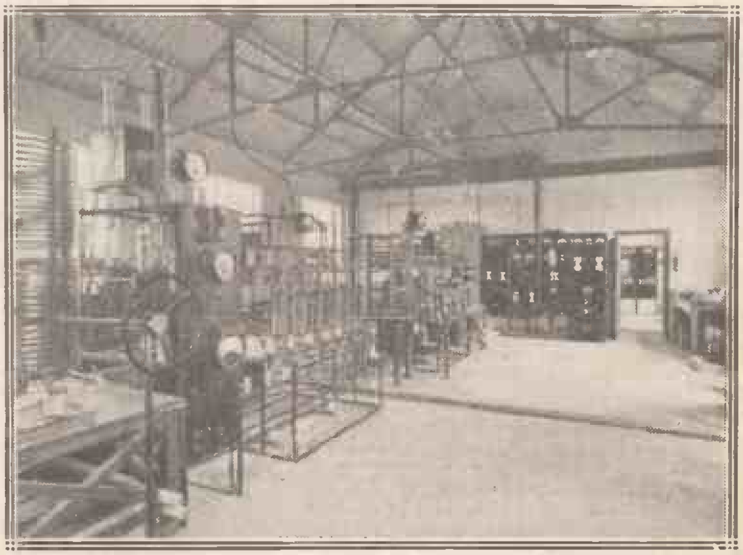
Among the many other messages picked up and translated by Sir Alfred and his staff was the Zimmerman telegram which, as my readers will remember, was a conditional offer to Mexico of an alliance against the United States of America. At that time, President Wilson had not quite made up his mind whether to plunge the United States into war.

In fact, it might be said that he was hesitating on the very brink of a terribly vital decision as far as the Allied Cause was concerned.

The Last Straw.

But when the Zimmerman telegram was translated and its contents communicated by Lord Balfour to the American Ambassador, Mr. Page, and by Mr. Page direct to President Wilson, that proved to be the turning point in the fateful decision made by the United States.

It might be said that through the expert work of Room 40 a wireless message, which was intercepted and forwarded to the United States, directly resulted in America coming into the war.



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1 Pair panel brackets (Magnum).
1 Broadcast wave, Master Three coil (Colvern).
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1 On and off switch (Bulgin).
1 R.C.C. unit, type A, (R.I.-Varley).
1 L.F. transformer, G.P. (R.I.-Varley.)
1 Combined grid leak, 2 megohms, and condenser, ·0003 mfd. (Mullard).
4 Terminals—A., E., L.S.—, L.S.+ (Belling-Lee).
1 Set of A B C connecting links (Junit).
2 Spade terminals—1 red. 1 black (Eelex).
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Traders and manufacturers are invited to submit wireless sets and components to the "P.W." Technical Department for test. All tests are carried out with strict impartiality in the "P.W." test-room, under the supervision of the Technical Editor, and the general reader is asked to note that this weekly article is also intended to provide a reliable and unbiased guide as to what to buy and what to avoid.—EDITOR.

CAMDEN FIXED CONDENSER.

We recently received a fixed condenser from The Camden Electrical Co It is classified as a "super-tension" and it is stated that it is not a mass production article, but that each condenser of this type is hand made and stamped with a serial number, and is issued with a signed guarantee to give six months' satisfactory service under voltage conditions as tabulated in a descriptive leaflet. The sample sent us has a capacity of one microfarad and is known as the Mark 10 type, this being one that has a working voltage of 800 volts D.C. and 500 A.C. and costs 14s.

It measures about 4 in. by 2 in. by 1½ in. and is contained in a red-coloured metal casing on the top of which are two substantial brass terminals. On test we found the capacity to be very close indeed to the rating, actually being substantially as stated, while its power loss is extremely low. It held a charge for a number of hours, an acid test for a component of this type. It appears to be in every respect a trustworthy production and we should have no hesitation whatever in connecting it directly across mains within the voltage limitations of those stipulated.

SIX-SIXTY CONE LOUD-SPEAKER PAPER.

We recently received samples of the new "Six-Sixty" Cone Loud-Speaker Paper. This is a specially prepared substance for the construction of home-made cone-type loud speakers. Full instructions for cutting and fixing the paper are provided but, as this latter is very clearly marked, it is a very simple business indeed. A minute or two's work enables one to possess a complete cone diaphragm equal in appearance and efficiency to a professional production. It is a most excellent material and is better than anything of its kind that we have yet come across. The paper is obtainable in small and large sizes at 2s. 6d. and 3s. 6d. respectively.

N.S.F. VARIABLE CONDENSER.

Messrs. S. W. Lewis & Co., of Victoria Street, London, S.W.1, recently sent us one of their Mid Log Line ·0005 mfd. variable condensers. It appears to be a very robust and attractive article. A solid metal girder construction carries the spindle and its bearings and the moving vanes. The fixed vanes are carried on two substantial ebonite cross pieces. A very useful feature is that the condenser can be mounted either on the panel, or screwed down on the baseboard. The movement is smooth and positive and such that it is impossible for the vanes to lose alignment. And, by the way, the vanes are of hard metal and are solidly grouped.

The N.S.F. Variable is a soundly-designed and soundly-produced component and will appeal to the discriminating constructor. From the same source we received a Weilo L.F. Transformer model 10 power. This is a German production, but we must say it is one of the best of these we have seen, although the average German L.F. transformer imported to this country is a pretty poor affair. This Weilo has a ratio of 5 to 1, is of the shrouded type and retails at 11s. 6d. On test it gave really good results, much better than its origins would lead one to anticipate. It embodies a fair amount of iron, actually it weighs 1¼ lbs., and on an audio test it appeared to have a creditable curve.

(*Continued on page 934.*)

"INDISFENSO" HIGH TENSION ACCUMULATOR CHARGER.

The "INDISPENSO" Accumulator Charger will charge your H.T. Accumulators effectively and at negligible cost from your D.C. Lighting Mains. Will trickle-charge your L.T. Accumulator *at No Cost* when light is in use. Complete with Polarity indicator. Thousands in use.

Price 6/- each

"GOLTONE" "COSSOR MELODY MAKER" COILS. Accurately wound to specification, with best double silk covered wire 5/- each.

"GOLTONE" L.F. TRANSFORMER

Most efficient and unsurpassed for purity and volume. The 5-1 type is ideal for use in construction of "COSSOR MELODY MAKER."

Price 17/6

"ALTERNO"

Thousands are using the "ALTERNO," at home, for charging their H.T. Accumulators efficiently and economically from A.C. Lighting Circuits. Satisfaction assured, supplied complete ready for use.

Price 21/-

With Ammeter (as illustrated) 12/6 extra.

From all leading Radio Stores. If any difficulty write direct. Write for large Illustrated Radio Catalogue P.W./R117, post free on request.

Ward & Goldstone
PENDLETON. MANCHESTER Ltd

EVERYTHING *The G.E.C. your guarantee* ELECTRICAL

Use the D.E.H. TYPE of the New Osram Valves

with the New Filament.

RESISTANCE CAPACITY COUPLING

To-day's popular method of Amplification.

The D.E.H. Group specially designed for this work.

TYPE	VOLTS	AMPLIFICATION FACTOR	IMPEDANCE	
Osram D.E.H. 210	2	35	75,000	10/6 each
Osram D.E.H. 410	4	40	70,000	
Osram D.E.H. 610	6	40	65,000	

MADE IN ENGLAND.

Advt. of The General Electric Co. Ltd., Magnet House, Kingsway, London, W.C.2

Each the best at its job

Igranic L.F. Choke Type "G"

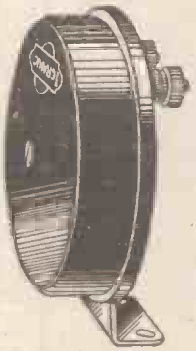
This L.F. Choke is outstanding as possessing an exceptionally high inductance, together with a very high saturation point, making it supreme for intervalve choke coupling. One of the wireless trade journals, in a review, stated the Igranic L.F. Choke, Type "G," to be the best they had ever tested. These qualities have been made possible by a specially wound coil of very low self-capacity and an iron core of very generous proportions.

A special feature of this Choke is the provision for connecting in series or parallel, enabling two inductances to be obtained, one suitable for intervalve coupling, and the other for an output filter.

Inductance with Series connection—370 henries at 2 milliamps.

Inductance with Parallel connection—40 henries at 15 milliamps.

Price 27/-



Igranic H.F. Choke

The best value in high-frequency Chokes on the market. By a special form of winding, the compactness of this high-frequency Choke has been obtained without any sacrifice of efficiency. Its external field is consequently very small and interaction with other inductances is reduced to a minimum. The self-capacity is very low, and the inductance is so high, that it is effective on wavelengths up to 3,000 metres.

Price 5/-

Send for List No. R72. It gives full particulars of these and the other Igranic Radio Devices.

Igranic components are always stocked by reputable dealers. All reports received by us of difficulty in obtaining them receive immediate attention.

COMPANY IGRANIC ELECTRIC LIMITED

149, Queen Victoria St., LONDON, E.C.4.
Works: BEDFORD.
Branches:
Birmingham, Bristol, Cardiff, Glasgow, Leeds, Manchester, Newcastle

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a cheap permanent source of H.T. Supply that re-charges itself overnight

Here is really wonderful news for all wireless listeners. Install the Standard Self-generating Leclanche battery and obtain positive, permanent H.T. supply at a lower cost than ever before.
Just think of it! You can definitely do away with the ever-present worry of run-down batteries and spoiled programmes. The Standard battery is simplicity itself to maintain. Use it how you will—evening after evening, it supplies a steady current that maintains a wonderful clarity of music and speech.

Get this Free Book

Take the first step by sending for FREE Booklet describing every detail for installing and maintaining this super-efficient and money-saving battery.

For 2-VALVE SETS:	For 3-5 VALVE SETS:	For SUPER-SETS:
A.4 90 volts. 25/1	D.6 108 volts. 37/3	P.6 126 volts. 69/6

Goods for 10/- or over carriage paid. Deferred Terms easily arranged.
State number and type of valves when ordering.
Write now to—
Dept. (A), WET H.T. BATTERY CO.,
12, Brownlow Street, London, W.C.1,
STOCKED BY HALFORD'S CYCLE STORES.

STANDARD
SELF-GENERATING
PERMANENT
H.T.
SUPPLY
The Vital Power in Radio!
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PLEASE be sure to mention "POPULAR WIRELESS" when communicating with Advertisers. THANKS!

BRITISH MADE Dull Emitter
GUARANTEED **VALVES**

Alltypes
WHY pay fancy prices or buy an unreliable Foreign Valve? These are good British made and Guaranteed—at real pocket-saving prices.
5/- ONLY EACH
Post free from

2 v. ·06	amps.	H.F. & L.F.
2 v. ·1	„	H.F. & L.F.
2 v. ·25	„	POWER
4 v. ·06	„	H.F. & L.F.
4 v. ·1	„	H.F. & L.F.
4 v. ·12	„	POWER
4 v. ·25	„	POWER
6 v. ·1	„	H.F. & L.F.
6 v. ·25	„	POWER

HOWARTH'S BRITISH VALVE DEPOT,
288, Deansgate, Manchester. (*Trade Supplied*).

APPARATUS TESTED.

(*Continued from page 932.*)

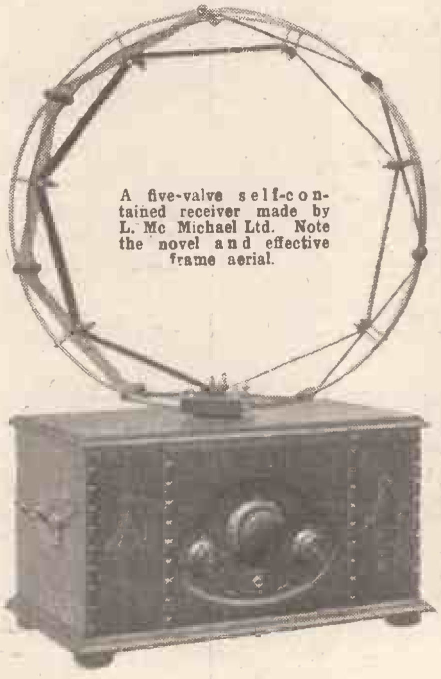
BROWNIE POPULAR TRANSFORMERS.

The Brownie Wireless Co., Ltd., of Nelson Street Works, Mornington Crescent, London, N.W.1, recently sent us one of their Popular transformers. It is quite a good little component, and appears to be well worth its 9s. 6d.

We should not advise its use in second-stage work, but for this there is recommended a Brownie L.F. transformer of a superior type costing 15s. The Popular model is contained in a cleanly moulded case, on the top of which are four substantial terminals. It is quite appreciably better than many of the cheap foreign transformers retailing at similar prices which we have tested, and it has the added advantage that it is British made.

BURGESS BATTERIES.

The Rothermel Radio Corporation of Great Britain, Ltd., has just concluded arrangements with the Burgess Battery Co. which enables them to handle the complete range of Burgess Batteries exclusively throughout the British Isles. The Burgess Battery Company maintain extensive laboratories, and is notable for the quantity of scientific literature they produce concerning their products. They make all types of dry batteries—from small ones suitable for grid bias up to large high-capacity types.



A five-valve self-contained receiver made by L. Mc Michael Ltd. Note the novel and effective frame aerial.

The 45-volter sent us by the Rothermel people has a weight of some 9½ lb., a length of about 8 in., and a height of about 7 in. It is stated that it will give up to 40-milliamps, while its service hours of life approximate 400 at a drain of ten milliamps. It is a heavy, well-made battery, and although we have had it in use now for some] two weeks, at periods of discharge up to four hours, and currents between 20 and 25 milliamperes, its voltage has been maintained. There is a demand for heavy reliable H.T. batteries, and, if available at reasonable prices, these Burgesses can be assured of a hearty welcome.

ADANA AUTOMATIC SELF-INKING
PRINTING MACHINE
NEW ALL-STEEL SUPER-MODEL
45/- MACHINE COMPLETE
COMPLETE REVISED PLANT 57/6

PLATEN (HEAVY PRESSED STEEL)
PLATEN ADJUSTMENT
MOVABLE GRIPPERS
SOLID IMPRESSION SPEEDY CONTROL
ADJUSTABLE BEARERS
CAN BE FITTED FOR TREADLE OR POWER.
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The Machine that is Built from the experience of over 10,000 Users of the old Model.
This all-steel Machine is a fine piece of engineering. Nearly 15,000 users of Adana Printing Plants, saving enormously in their own work, and hundreds making an excellent living. Will print any matter from a **CHEMIST'S LABEL to an ILLUSTRATED MAGAZINE** at a really commercial speed, including Perforating, Creasing and Box-making. Only finest materials used in its construction. Simplicity to the extreme; no special skill required. Large numbers of boys producing school and Scout magazines. Real Printers' metal type, case, complete accessories and fully illustrated instruction-book included in plant. Two-coloured illustrated particulars and samples of work sent on receipt of stamped addressed envelope.
This model is designed for commercial use in all large and small printing establishments. Machines can be shipped abroad C.O.D. cash against documents in London. Goods F.O.R. Twickenham.
THE ADANA AGENCY
is a complete organisation for the supply of Printing Office Equipment of every description for the small working Printer and Business House Printing Dept. Controlled by most highly skilled and long experienced men of the Printing world, having expert technical knowledge of every part of Letterpress Printing.
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A.P. 4-ELECTRODE VALVES
Double Range and Triple Volume when used on your existing set and H.T. Battery.
SPECIAL H.T.-LESS VALVES and SCREENED GRID VALVES.
Write to-day for full data and X-ray photographs of the A.P. family.
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REPAIRS—THREE MONTHS' GUARANTEE accompanies all our repairs. Any make of L.F. Transformer, Headphone, or Loud-Speaker, repaired to maximum efficiency, 4/- Post Free. Terms to Trade.
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DX PLUG-IN COILS
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THE PERFECT WET H.T.
Assured with our new Insulating Liner, Jars, 1/3 doz, plain; 1/6 doz. waxed; Special Zincs, 1/- doz.; High-Capacity Sacs, 1/6 doz.; Perforated Liners, 4d. doz. Post Free on three dozen Units and over, including special divided carton suitable as a container. Send 6d. for sample complete unit, particulars and instructions. We stock Seamless Moulded Cone Parts. Telephones and Loud Speakers re-wound.
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DON'T waste money. Build your own H.T. Eliminator and get current from your electric light mains. Here's a book that shows you how to do it. Its concise instructions and clear diagrams can easily be followed by anyone. It is written by Mr. W. James for, appropriately enough, the makers of T.C.C. Condensers. Send the coupon and stamped addressed envelope for it to-day, and build an eliminator which, because it uses T.C.C. 600 volt Condensers is utterly safe and reliable.

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I enclose 1d. stamp to cover postage of your book "How to build your own H.T. Eliminator for A.C. or D.C."

Name ……………………………………

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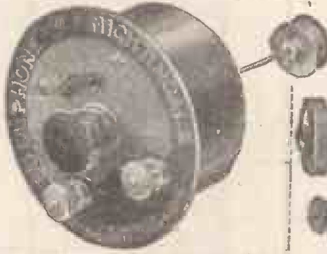
MAKE YOUR OWN CONE SPEAKER

TWO WONDERFUL UNITS AT ONLY 15/- EACH

YOU'LL BE SURPRISED!

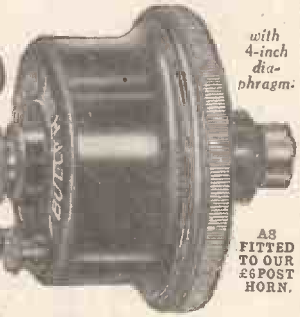
The New Wonder "Nightingale"

CONE UNIT



AS FITTED TO OUR CABINET CONE

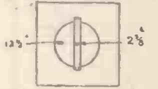
GRAMOPHONE ATTACHMENT



with 4-inch diaphragm.

AS FITTED TO OUR £6 POST HORN.

From a 3-ply board, 3 ft. square, cut out a 12½" circle, then cut a strip of wood 16" x 3½" and make a hole



2⅝" dia. in centre. This will carry the unit. Fix strip to board as shown.

BULLPHONE DOUBLE PAPER CONE 2/-
Postage 3d. extra.

Exactly as fitted to our own Speakers.

Reduced from 32/6 to 15/- solely as an advertisement for the famous Bullphone Nightingale Loud Speakers. Cobalt Magnet guaranteed for all time.

Astonishing Results, *equal to the most expensive Loud Speakers yet made, are guaranteed with either of these Units.*

10/- DEPOSIT BUY ON EASY TERMS 5/- DEPOSIT

10/- SECURES THIS SPEAKER. 5/- SECURES THIS SPEAKER

SEND DEPOSIT NOW.

CABINET CONE

Size 17 ins. high by 15 ins., in Mahogany, Walnut or Rosewood finish.

77/6 cash, or EASY TERMS 10/- deposit and 12 monthly payments of 6/-

21 ins. high, with 14-inch Bell, Mahogany finished, with plated arm and stand.

DE LUXE

57/6 cash, or 5/- deposit and 12 monthly payments of 5/-

SATISFACTION GUARANTEED OR MONEY REFUNDED.

Obtainable from your local dealer or direct from:—

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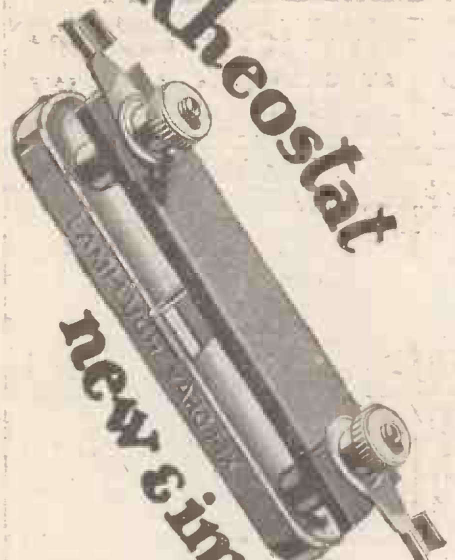
Regd
NIGHTINGALE SPEAKERS

Varo-Fix Rheostat



new & improved model

This is the Rheostat that everyone will use. It is built upon an aluminium base which carries a special spring slider, making a positive contact with the resistance element, which is removable, and can be replaced with others of different value. It is very compact, occupies but little space, and can be put near to valveholders, thereby reducing the wiring —a desirable feature in modern Radio Receivers.

Far superior to automatic devices because it can be positively set to suit each individual valve and not left to chance.
PRICES: 2, 6, 15 or 30 ohms 1/2 each

LAMPLUGH
BRITAIN'S BEST RADIO
"LAMP-LOO"

S. A. LAMPLUGH LTD.
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SEND FOR LISTS OF OUR HIGH-GRADE COMPONENTS

RADIOTORIAL.

All Editorial Communications to be addressed to The Editor, POPULAR WIRELESS, The Fleetway House, Farringdon Street, London, E.C.4.

The Editor will be pleased to consider articles and photographs dealing with all subjects appertaining to wireless work. The Editor cannot accept responsibility for manuscripts and photos. Every care will be taken to return MSS. not accepted for publication. A stamped and addressed envelope must be sent with every article. All inquiries concerning advertising rates, etc., to be addressed to the Sole Agents, Messrs. John H. Lile, Ltd., 4 Ludgate Circus, London, E.C.4.

The constructional articles which appear from time to time in this journal are the outcome of research and experimental work, carried out with a view to improving the technique of wireless receivers. As much of the information given in the columns of this paper concerns the most recent developments in the radio world, some of the arrangements and specialities described may be the subject of Letters Patent, and the amateur and the trader would be well advised to obtain permission of the patentees to use the patents before doing so.

QUESTIONS AND ANSWERS.

AMPLIFYING A CRYSTAL SET.

"VOLUME" (Chertsey, Surrey).—"Recently I purchased a one-valve amplifier which I have been trying to use with my crystal set, without much result. The crystal set itself gives very good results, but when the amplifier is connected up the strength is not much more and there is a faint but objectionable humming noise. Is it correct to connect the 'phone terminals of the crystal set to the input of the amplifier, and is this all that is necessary?"

In addition to connecting the output from the crystal set to the input of the amplifier, it is generally necessary to earth the amplifier's battery to get good results. All that you need do is to connect the L.T. negative terminal of the amplifier to the earth terminal of the crystal set.

"P.W." TECHNICAL QUERY DEPARTMENT

Is Your Set "Going Good?"

Perhaps some mysterious noise has appeared and is spoiling your radio reception?—Or one of the batteries seems to run down much faster than formerly?—Or you want a Blue Print?

Whatever your radio problem may be, remember that the Technical Query Department is thoroughly equipped to assist our readers, and offer an *unrivalled* service.

Full details, including a revised scale of charges, can be obtained direct from the Technical Query Dept., "Popular Wireless," Fleetway House, Farringdon Street, London, E.C.4.

A postcard will do: On receipt of this an Application Form will be sent to you free and post free, immediately. This application will place you under no obligation whatever, but having the form you will know exactly what information we require to have before us in order to solve your problems.

POLARITY OF TELEPHONES.

"CRYSTAL SET" (Swindon, Wilts).—"The terminals of my telephones are marked with a negative and positive sign, and the leads are red and black respectively. Does it matter

(*Continued on page 938.*)

Does YOUR H.T. BATTERY Last 9 Months?

Mr. Percy W. Harris, M.I.R.E., in an article on H.T. Economy, which appeared in "Popular Wireless," issue dated December 3rd, using the sub-heading, "How Long Should the H.T. Battery Last?"

Provided you have chosen the proper type of battery to suit the circuit and valves used in your set, you should get 9 months' service from it.

Read this extract from the article mentioned:
"A set that has three or four valves is very extravagant to run on the small size of high-tension batteries. The larger sizes are more expensive as to first cost, but much cheaper in their cost per hour."

Is it not better to have a 15/6 battery which lasts, say nine months, than one at 7/9 which lasts only three?

RIPAULT'S SELF-REGENERATIVE H.T. DRY BATTERIES

are super in construction and of exceptional capacity. They are supplied in Standard, Double, Treble, and Quadruple capacities.

All readers of "Popular Wireless" should apply for Ripaults Free Chart on the "right choice" for your set, and the "life" of Ripaults H.T. Dry Batteries which give 50 per cent. longer service. Write for Chart P/W.50.

RIPAULTS Limited

King's Road, St. Pancras, London, N.W.1.

Proof of its excellence

RESISTON PANELS

and

Terminal Strip

are used in the

Cossor Melody Maker Receiver

Panel: (in black) - - - 9/3
„ mahogany grained 11/6
Terminal Strip - 2/-

Get them from your Dealer

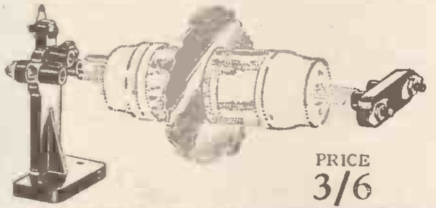
American Hard Rubber Co. (Brit.) Ltd., 13a, Fore Street, London, E.C.2.

1325

Ashley Radio

JACKS
PLUGS
RESISTORS
RESISTANCES
R.C.C. UNITS
VALVE HOLDERS
LOUD SPEAKERS
MULTIPLE FIXED CONDENSERS ETC.

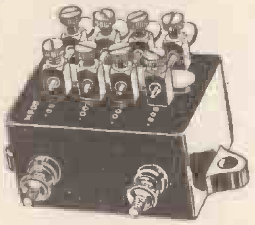
SCREENED-VALVE HOLDER



PRICE 3/6

Conveniently made in two pieces, enabling the valve to be inserted or extracted at will. Fitted with Terminals and Soldering Tags. GENUINE BAKELITE.

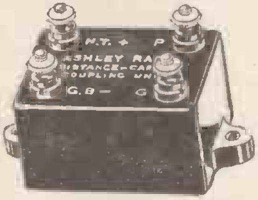
MULTIPLE FIXED CONDENSERS



Although cheap enough to be incorporated permanently their main function is to determine the correct capacity of fixed condenser required in any specific circuit. Two ranges of capacity are made and capacities varying from ·0001 to ·0015 are obtainable in steps of ·0001 and similar variations are to be obtained with the second unit the minimum capacity of which is ·001. The acme of neatness and efficiency

PRICE 5/6

Resistance Capacity Coupling Unit. (A&B)



Made to suit the valves now marketed for R.C. circuits it is a first rate example of what can be accomplished by a careful study of up-to-date requirements in every direction. So far as can be determined it represents the best ideas in practice, the more remarkable in consideration of its compactness. The "A" unit suits all valves the impedance of which is less than 40,000 ohms and is recommended especially for the detector stage. For valves with an impedance value of over 40,000 ohms the "B" unit can be most effectively used.

PRICE 5/6 each.

If your dealer cannot supply, we send post free.

ASHLEY WIRELESS TELEPHONE CO. (1925) LTD.,
Finch Place, London Road,
LIVERPOOL.

all Guaranteed Components

A Perfect Combination !

—the Ericsson Family Two Loud Speaker Set and the Ericsson Super Tone. They combine to give the finest possible rendering of the "local" and 5 X X or 5 G B.

The set is beautifully made in a sturdy Oak cabinet. All parts enclosed. Price £6 - 15 - 0. Royalties 25/-. The Ericsson Super Tone costs 45/-.

On sale at all good dealers, or direct from :—

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Ericsson APPARATUS

Ericsson Ericsson Ericsson Ericsson Ericsson

REFINEMENT L&P IN RADIO

You'll wish you'd built the L. & P. 3-20 EXPRESS

They're telling us It's Better!

Ask your Wireless Dealer for FREE COPY of Circuit

THERE IS NO SUBSTITUTE

This is the Battery for You

It costs a *little* more—
But it lasts a *lot* longer.
It is much, much cheaper
In the end. Remember its name—

Columbia

No. 4780, 60 volts type : 22/6.

High Capacity Radio Batteries

Columbias are high capacity batteries of exceptional efficiency. They are built to meet the demand for *something better*. They will give you longer service; they will positively save you money.

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DIX-ONEMETERS

are the best Bargain ever offered to radio users. £10 worth of precision, Multi-range Mirror scale, Jewelled knife-edge Instrument for **55/-**

NEW A.C. MODEL "Onemeters"
Ready Jan. 1st. Ask for A.C. leaflet.

MELODY MAKER "VIOLINA"
A cabinet loud speaker listed at £5 and worth it.
Sale Price - 25/-

ELECTRADIX RADIOS, 218, Upper Thames St. E.C.4

Dealers! Don't Miss This.

NUMEROUS CLEARANCE LINES.
LOUD SPEAKERS, VALVES, BATTERIES.
CALL ONLY.
THE ENTERTAINMENTS SUPPLIES CO.,
159, BISHOPSGATE, LONDON, E.C.2.

RADIO PANELS

REGISTERED CROXSONIA TRADE MARK

7× 6,	1/3
8× 6,	1/4
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PLEASE MENTION "POPULAR WIRELESS" WHEN REPLYING TO ADVERTISEMENTS.

RADIOTORIAL QUESTIONS AND ANSWERS

(Continued from page 936.)

which way round I connect them up on a crystal set ?"

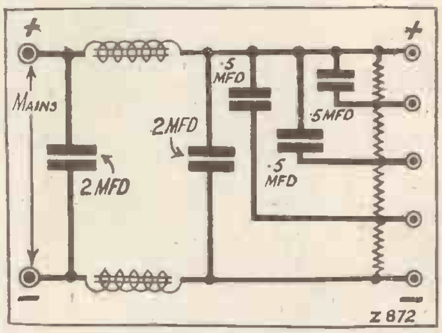
No, the marking is only intended for use in case of a valve set where a steady current flows through the 'phones which will demagnetise them if they are not connected in the correct direction. In a crystal set the 'phones may be connected either way round without detriment.

TUNED-ANODE IMPEDANCE.

H. A. (Minehead, Somerset).—"Why is it that the tuned anode is spoken of as a high impedance when the coil through which the current flows has a resistance of only a few ohms. Surely this is a very low value when compared with, for instance, an anode resistance ?"

The impedance of a tuned-anode circuit comprising a coil and condenser has very little to do with the direct-current resistance of its coil. When a coil and condenser are tuned to a frequency exactly corresponding with the frequency of the alternating current applied to them, the phenomena of resonance sets in, and they offer an extraordinarily high resistance to alternations of that frequency. This impedance can easily be of the order of many thousands of ohms, although the coil's resistance to direct current is only a few ohms.

WHAT IS WRONG?



The above diagram is supposed to represent the connections of an H.T. Battery Eliminator, for use on D.C. mains, but it is wrong and would not work properly.

Next week the correct diagram will be given, and to test your skill we shall continue to publish every week a diagram in which a mistake (or mistakes) has been inserted. The correction will be published the following week.

No prizes are offered, but by following this series and trying to solve the problems week by week the reader cannot fail to learn a lot about radio circuits.

GRID-LEAK CONNECTIONS.

L. W. (Alexandria, Egypt).—"I have always been puzzled by grid-leak connections. Why is it that sometimes the grid leak is shown across the grid condenser; sometimes to the positive side of the valve filament; sometimes to its negative; and sometimes to a point on the lead between the battery and the rheostat ? What is the correct connection for it ?"

Whether it is better to connect the grid leak return to the negative or to the positive lead from the filament battery depends upon the type of valve to be used. Some valves give better results one way, and some the other. Most of the modern detector valves work at highest efficiency when the grid leak is taken to the positive lead. In practice it makes no difference whether the grid return is taken to the filament end of the lead, or to the battery end, nor whether it is between the rheostat and the valve or the rheostat and the battery.

OVERHAULING TELEPHONES.

J. B. (Maidstone, Kent).—"As my telephones seemed to be getting weaker I very carefully took them to pieces the other day,

(Continued on page 940.)

A NEW VALVE for the NEW YEAR

In addition to the renowned K Type Valve we have pleasure in announcing the introduction of the new

FRELAT Dark Emitters

which are destined to be the New Valves for the New Year. It is the Valve you've long been waiting for. It is the *really long life* Valve. It guarantees perfect reception at minimum cost and consumption. Filament Volts 1·6-1·7 Filament Amps ·1 Price 6/6. Also made to take 4 volts at same price.

Other types available:
New K. Type made with ebonite sockets 2 volts. Now use only ·2 instead of ·3 Price reduced from 4/11-4/6. All valves sent Post Free or C.O.D. Plus 6d. Full particulars on request.

6/6

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'Grams: Radinenta, Ald. London.

HEADPHONES REPAIRED.

Rewound and re-magnetised 4/- per pair. Loud Speakers repaired 4/-. Transformers rewound 5/- each. *All work guaranteed and tested before delivery.* Write for Trade Prices. *'Phone: Clerk. 1795.*
MASON & CO., 44, East Rd., City Rd., N.1.

USE RADIAX COILS & CHOKES for all Famous Sets.

THREES. Melody Maker	7/6
Monotune (with base)	13/-
Master Three (with base)	13/-
FOURS. Everyman Four. Pair	28/-
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Formers only & Base	11/-
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3 Bases	3/9
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Radiax Choke, 150/4,000 metres	5/9

(See "Wireless World" excellent test report).
COIL LIST, stamp. CATALOGUE, with lists of parts for several of above famous circuits, 2d.

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THE LITTLE CELLS THAT SATISFY.
Eton Primary H.T. Battery. P.1. Porous Pot Cells, S1 and S2 Sac Cells. All complete.

	1-cell	6-cell	12-cell	30-cell
P1	6½d.	3/3	5 9	14/-
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S2	4½d.	2/6	3/10	9/6

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Send for List. —— Dept. P.W.,
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FOR MOUNTING ON METAL OR WOOD
PERFECT INSULATION
Two required for each hole
Orders under 1/- send 1½d. postage.

NUMBER	0	1	2	3	4	5	6
Hole in Bush	6BA,	4BA.	2BA,	¼",	5/16",	⅜",	7/16"
Price each:	1d.	1d.	1d.	1½d.	2d.	2d.	2d.

(Complete List of sizes free on application)
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GLAZITE makes wiring simpler, quicker, more efficient and cheaper. It is flame-proof, damp-proof and does not deteriorate in use.

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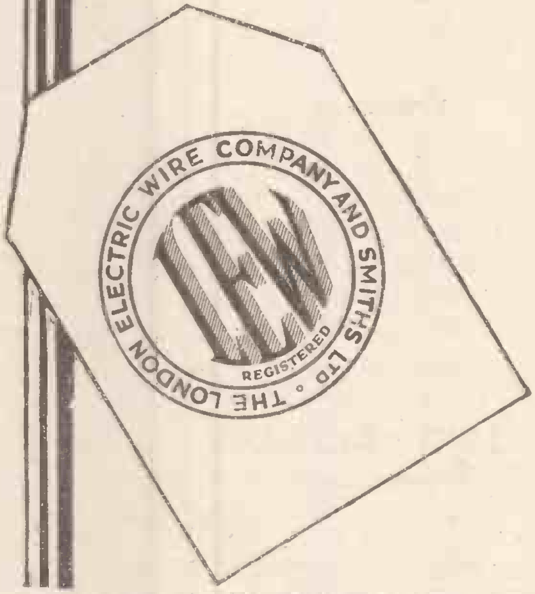
PLAYHOUSE YARD, GOLDEN LANE - - LONDON, E.C.1

GLAZITE
BRITISH MADE REGD.
THE *ORIGINAL* COLOURED CONNECTING WIRE

Obtainable in six colours: Red, Yellow, Blue, Green, Black and White. Price 10d. per 10 ft. coil; 9d. per packet of four 2 ft. lengths (assorted colours). From all good radio dealers.


THE LONDON ELECTRIC WIRE COMPANY AND SMITHS LTD
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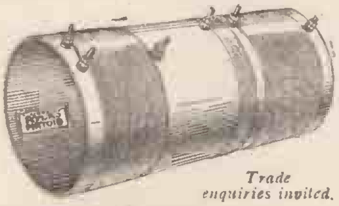
CLARKE'S
"ATLAS"
PIRTOID TUBING
Without a rival for the Cossor "Melody Maker"

Ideal for every description of Solenoid Coil



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Trade enquiries invited.

FORMO

14/6

LOW LOSS TWO RANGE COUPLER
250 to 550 and 1,500 to 2,000 metres.

This Tuner is constructed on Low Loss Principles with Solenoid and Bankwound Coils, acknowledged to be the most efficient form of coil winding. It is so arranged that a two-contact Pull-Push Switch shorts the high wave coil, leaving only the low wave coil in circuit.

CROWN WORKS, CRICKLEWOOD
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'Phone: Hampstead 1787.

Full Catalogue free on request.

Heaps of Jolly Music

Think of the many jolly hours this Brownie 2-valver would bring. Imagine the different programmes you could listen to, seated at your own fireside! Amazing loudspeaker clarity on all wavelengths. Write to Department 26 for our new Booklet "Wireless without Worry."

50/-

Very well finished, handsome appearance, complete with two coils—but without valves. Marconi royalties extra.

The BROWNIE WIRELESS 2-VALVER ®

BROWNIE WIRELESS COMPANY (G.B.) LTD.
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Electradix Bargains

THE DIX-ONEMETER. The 55 Range "Rolls Royce" of Radio. An instrument of Exact Precision reading. 40 micro-amp. to 20 amps., 2 milli-volts to 2,000 volts. Measures Crystal Signals or Resistances from 50 ohms. to 50 megohms. Instrument De Luxe, 55/-. Multipliers, each 6/6. Sent C.O.D. anywhere.

INSTRUMENTS. We are specialists and makers. Our stock is the finest in London. Multi-Range. Testers, A.C. and D.C. Resis., Capacity, and Inductance Bridges. Microammeters and all panel meters at rock-bottom prices. Moving Coil Milliammeters from 15/-.

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GYROSCOPES. £25 Navy Torpedo in mahogany case. Beautiful workmanship. Price 15/-.

RELAYS. Western, 25/-; G.P.O., 40/-; Magnetic Relays, 10/-; Dixon Fila. Distant Control Switches auto. on and off, 15/-, list 30/-.

TABLE ELECTRIC PROJECTORS for Photo Slide or Home Television experiments. 4 Magnif. and focus lenses, swivel stand. Socket cord and plug for supply mains or battery. Sale 25/-. Few only. Handsome present. Cost £4 quite new.

PRECISION CONDENSERS, Polar. Full dial sq.-law, ·0003 mfd., 3/6; ·0005 mfd., 4/6; list 12/6. Panel 3-gang Triple, 8/-, list 15/-. Penton ·001 Panel, 1-hole fixing Varia. Condensers, 2/6, list 8/-. Polar Rheos., 1/3, list 4/6. Polar Panel 2-way Coil Holders, 2/9, list 7/6. Polar Varia. H.F. Transformers, 300/500, 3/6, list 8/6. L.F. Gambrell, Inter-valve, 7/6, list 15/-. Polar Variometer panel and dial, list 21/-. Sale 8/6. Polar Detectors, Everset, 1/9.

ELECTRIC HEATERS, at under half cost. Immersion, 4/-; Hot plates, 7/6; Irons, 10/-; Massage Vibrator Sets, 21/6. In case. A handsome present.

LOUD SPEAKERS. 5 gns. Violina Cabinet is the greatest bargain ever. Wonderful tone. Sale, 25/-. Western Electric new, 2,000 ohms, reduced from 35/- to 15/-; T.M.C. Loud Speakers, 2,000 ohms, 10/-; Amplion, 26/6; Texas Cone, 2,000 ohms, with cord, 25/-.

SPEAKER PARTS. Pleated Paper, 2/-. Twin 12 in. nickel rims, 5/-. Reed 'phones, with needle, Brown's "A," 13/6. Skinder Reed Units. Famous Viola double pull Unit 15/6. Crystal Amplifiers, 25/-.

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BARGAIN RECEIVERS. These are all by first-class makers. 2-Valve, No. 33 Marconi Lid Case, all waves, 50/-. 2-Valve Mark 32, 250 to 1,800 metres, £4. Western Electric, 3-Valve, £6 5s. 3-Valve Aircraft, £4. Polar 4, Pol. Cab., £6 10s. 5-Valve R.A.F., with Valves, £5. 6-Valve Marconi De Luxe, £8. Sterling Surplus Anodian, £5 10s. Marconi R.B. 10 Crystal and 1-Valve closed Cabinet, complete with Valve, 22/6. Marconi Screened 6-Valve, £12, cost £50. 25 per cent discount on all purchases over £5. Royalties paid free.

AERIALS. Indoor Suspension, 2/6. Frame Aerials, midtap, 10/-. Pocket R.A.F., 110 ft. stranded cop., 1/3. Aeroflex, 49 strand cop., 100 ft., 1/4. Navy 7/22 Enam. bronze, 3/-; Electronic, 100 ft., 1/3. Maxi, braided cop., 50 ft., 1/3; 100 ft., 2/-. Indoor Aerial wire, 22 gauge, 1/- 100 ft. Earth Wire, 1/3 doz. yards.

MASTS. R.A.F. Steel Tubes, 15 ft., 7/6; 20 ft., 10/-; 30 ft., 14/-; in 2 ft. 8 in. by 1½ in. sections. Heavy Mast in Section, 4 ft. 3 ins. long, 2½ ins., 5/- each.

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MAINS UNITS. The DIX D.C. No live Terminals, Humless Filter, 3 taps, 30/-. De Luxe Model with Meter, 40/-. A.C. Unit with Control and 3 taps. Special Filter, £4 10s. **Condensers:** 2 mfd., 3/9; 4 mfd., 6/6; 10 mfd., 15/-; Fullertype Chokes, 200, 600, 1,000 ohms, 1/6. Power Chokes, 1,000, 1,400, 3,000 ohms, 4/6. 2 Electrode Rectif. Valves, 7/6. Transformers, 220 volts to 3, 5, or 8 volts, 12/6. To 20 volts, 14/6. Double wound for H.T. from A.C. mains, 220 volts, two centre tap secondaries for H.T., 20 m/a, 25/- each; 50 m/a, 37/6. New 8-v. Grid Bias Battery, 1/-. 11/- doz. Mid Tap Chokes for new Circuit 2/-

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ELECTRADIX RADIOS
218, Upper Thames St., E.C.4

RADIOTORIAL QUESTIONS AND ANSWERS

(*Continued from page* 938.)

to find that one of the diaphragms was quite rusty. Can this be prevented?"

It is a good plan carefully to wipe the telephones after they have been used for long periods and to very lightly coat the diaphragms with vaseline or pertroleum jelly to prevent the rust attacking them.

SHORTING THE GRID-BIAS BATTERY.

R. V. E. (Rugby, Warwickshire).—"On the grid-bias battery that I have bought the hole marked "O" is so close to the marked 1½ that when I put the positive plug in "O" and the negative in 1½ volts the two plugs touch. Does this damage the battery?"

If the metal parts on the two plugs are allowed to touch you will certainly short your battery, and no grid-bias voltage will be in circuit. If, however, it is only the insulating parts of the plugs that are touching this will do no damage and should not affect the operation of the receiver in any way.

THE EXTRA VALVE.

L. F. S. (Bradford, Yorks).—"I had a blue print given to me of a set called "The Universal Three." It is marked the "P.W." Blue Print No. 35, and shows four valves, although I am informed that it will work with only three. Is this correct, and why are there four valves shown when only three are necessary?"

Either three or four valves may be used in the "Universal Three," because in places where the receiver is situated fairly close to a broadcasting station the power developed is too great to be handled satisfactorily by one ordinary power valve, so the last two valves holders are connected in parallel so that two valves may be used here if desired. At greater distances there is less likelihood of the receiver being overloaded, and in these circumstances only one valve need be employed in the last pair of valve holders.

H.F. INSTABILITY.

N. C. B. (Glasgow).—"I made the H.F. transformer exactly as described, but when I use it the set violently oscillates all the time. Moreover, it is hopeless to try and neutralise it for there is no silent point at all. With a different H.F. transformer the set is all right. What is likely to be the cause of the trouble?"

Probably, when making the coil, you mixed up the connections in it. Try the effect of reversing the leads to the neutralising windings, to the primary windings, or both.

OVERLOADING THE LAST VALVE.

L. R. W. W. (Nottingham).—"My new three-valver gives me perfect results on several stations including Daventry, but unfortunately it always distorts a little on the local station when tuned in fully. When detuned a little it is perfect, but I cannot get the benefit of the full volume of which it is capable because of this distortion arising. What is the cause?"

Evidently you are overloading your last valve. When the input to the receiver is moderately strong the last valve can handle it on the straight portion of its curve. But louder signals cause the valve to work on the top or bottom bend (or both) and this causes uneven amplification which appears as distortion.

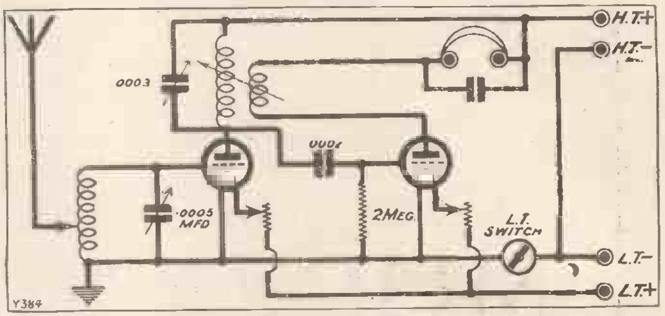
We regret that, owing to pressure on space, the last of the series, "The ABC of H.F. Amplification," and the column feature, "Notes on Short Waves," have had to be held out of this issue. They will, however, appear in "Popular Wireless" next week.

LOUD-SPEAKER LEADS CAUSE HOWLING.

J. W. N. (Leigh-on-Sea).—"Not long ago I fitted long extension leads to my set to enable the loud speaker to be used in another room. Ever since that time I have been troubled with howling. Do you think that the long leads are the cause of this, and how can it be prevented?"

You do not say if you are using a coupled output or if the long loud-speaker leads are inserted in the plate of the last valve. If this latter is the case we should certainly recommend you to use an output transformer, or else the choke capacity method of output coupling. If, however, an output circuit is already in use, keep the loud-speaker leads well away from the earth wire, and if possible improve the insulation and efficiency of the aerial-earth system. (To run the loud-speaker leads through a lead-covered cable, and earth the casing of this, is a certain cure.)

H.F. (TUNED ANODE) AND DET.



The correct connections for an H.F. and Det. receiver are shown above. In the "What is Wrong?" diagram last week the filament switch did not control both valves, the aerial condenser was ·005 mfd. instead of ·0005, and the grid leak was taken to H.T. + instead of to the filament circuit.

GAMBRELL CENTRE - TAPPED

coils are recommended for use in all circuits which are designed for extreme selectivity. Besides being excellent for this purpose, Gambrell Centre-Tapped coils can also be used with advantage in ANY circuit. Standard fitting to all coil sockets. Occupy minimum baseboard space.

SIZE.	PRICE.	Approx. No. of Turns.
a2	4/10	18
a	4/10	25
A	5/-	30
B1	5/3	40
B	5/6	50
C	5/9	75
D	6/3	100
E1	6/9	150
E	7/9	200
F	8/6	300
G	10/-	500

Prices quoted are Standard coils; Centre-Tapped, 6d. extra.

There is a Gambrell Coil Holder specially designed for use with these coils and which does away entirely with flex leads. Price 1/9 each.

GAMBRELL BROS. LTD., 76, Victoria St., S.W.1

TAYLEX WET H.T. BATTERIES.

New Prices: Jars, 1/3. Sacs, 1/2. Zincs, 11d. Sample doz. (18 volts), complete with bands and electrolyte, 4/3, post 9d. Sample unit, 6d. 16 page booklet free. Bargain list free. **AMPLIFIERS:** 1-valve, 19/-; 2-valve, 30/-. 2-valve **ALL-STATION SET.** £4.—**P. TAYLOR, 57, Studley Rd. Stockwell, London**

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"NIGHTINGALE" MASTER CRYSTAL DETECTOR

The Finest Detector in the World.

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We are now the sole suppliers of the genuine U.C. and Thorpe valves, as specially tested and recommended by the "Unidyne" inventors and "Popular Wireless." U.C.5 and Thorpe K.4. (both 4-electrode 5-pin valves). Post free. *Only direct from—*

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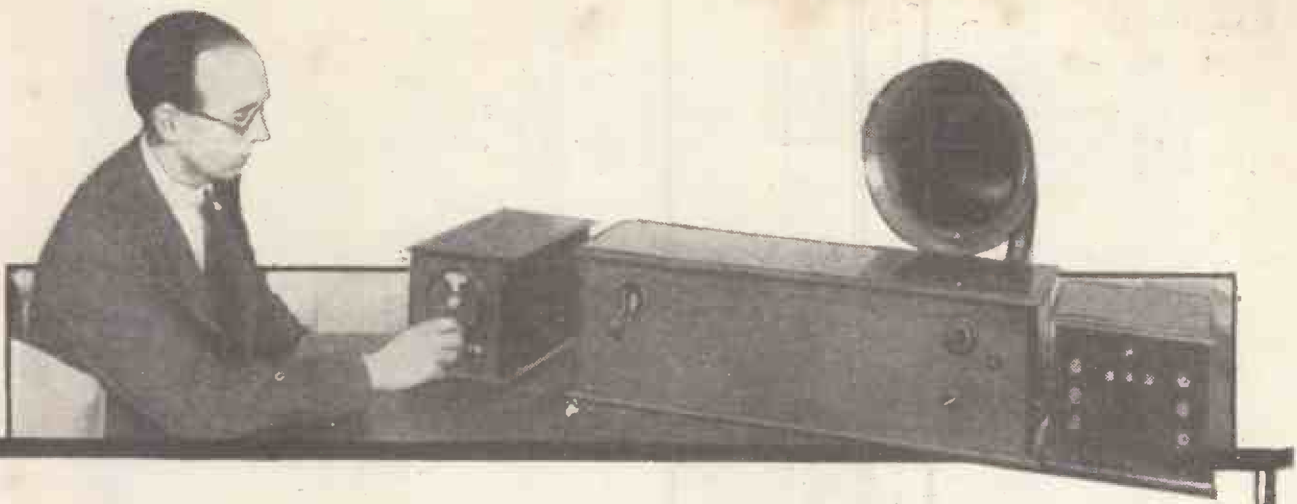

THE JANUARY NUMBER

OF

MODERN WIRELESS

will contain full constructional details of the very latest in valve receivers. Everybody remembers the phenomenal success of the original Solodyne one-dial control receiver described in "Modern Wireless" (June, 1926).

This Year's

"SOLODYNE"

surpasses that famous set in results, ease of construction and operation, while the adjustment of the one-knob tuning control has been greatly simplified.

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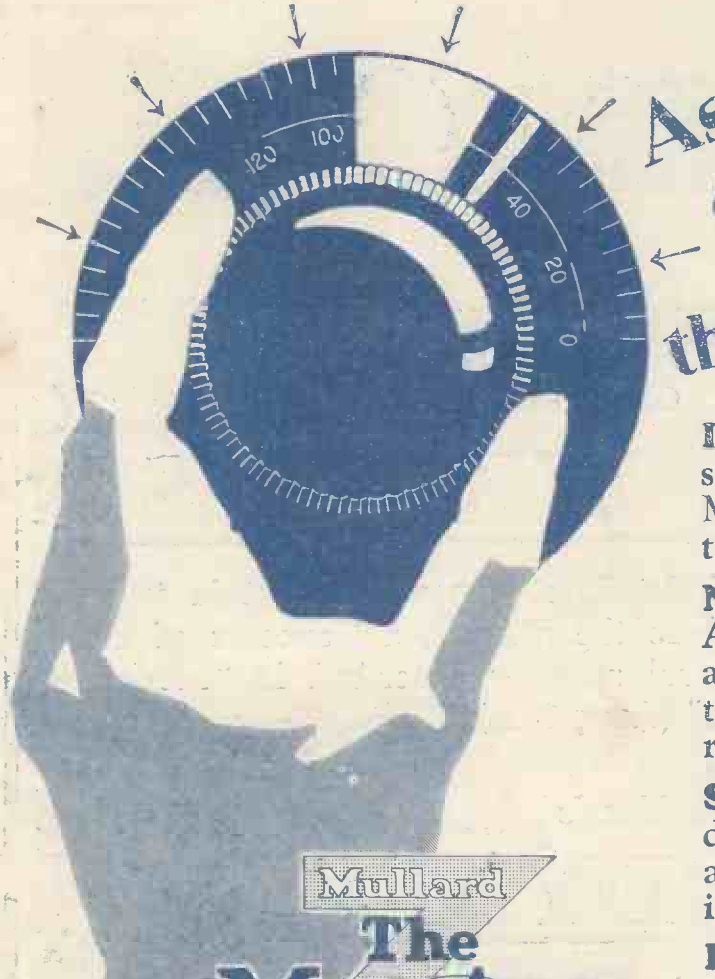
As easy as setting the hands of a clock



Mullard
The Master Three

In one hour using only a small screw-driver you can build the Mullard Master Three—the finest three valve receiver yet designed.

No soldering The packet of A.B.C. Connecting Links contains a complete set of 20 wires cut to the correct length and eyeletted ready to fix under terminals.

Simple certain tuning One dial to bring in station after station, another to increase volume. Used in London, cuts out London.

FREE Complete simplified Plan of Assembly and full instructions for the Mullard Master Three.

Build this wonderful 1928 receiver now!

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"Radio for
the Million,"
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Please send me FREE complete instructions and Simplified Plan of Assembly for the MULLARD MASTER THREE with No. 5 "RADIO FOR THE MILLION"

NAME (Block Letters) ....

Address..............................

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P.W. 2

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MASTER · RADIO

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R/R